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Engineering News-Record

Boston & Maine Discards Old Jack-Knife Bridges

Cement-Water Ratio—A New Relationship

South Essex Sanitary District in Massachusetts

Economics of Single-Track Concrete Highways

Earthquake-Proof Dam Built in Chile

Saddle-Horse Tunnel on New Glacier Park Trail

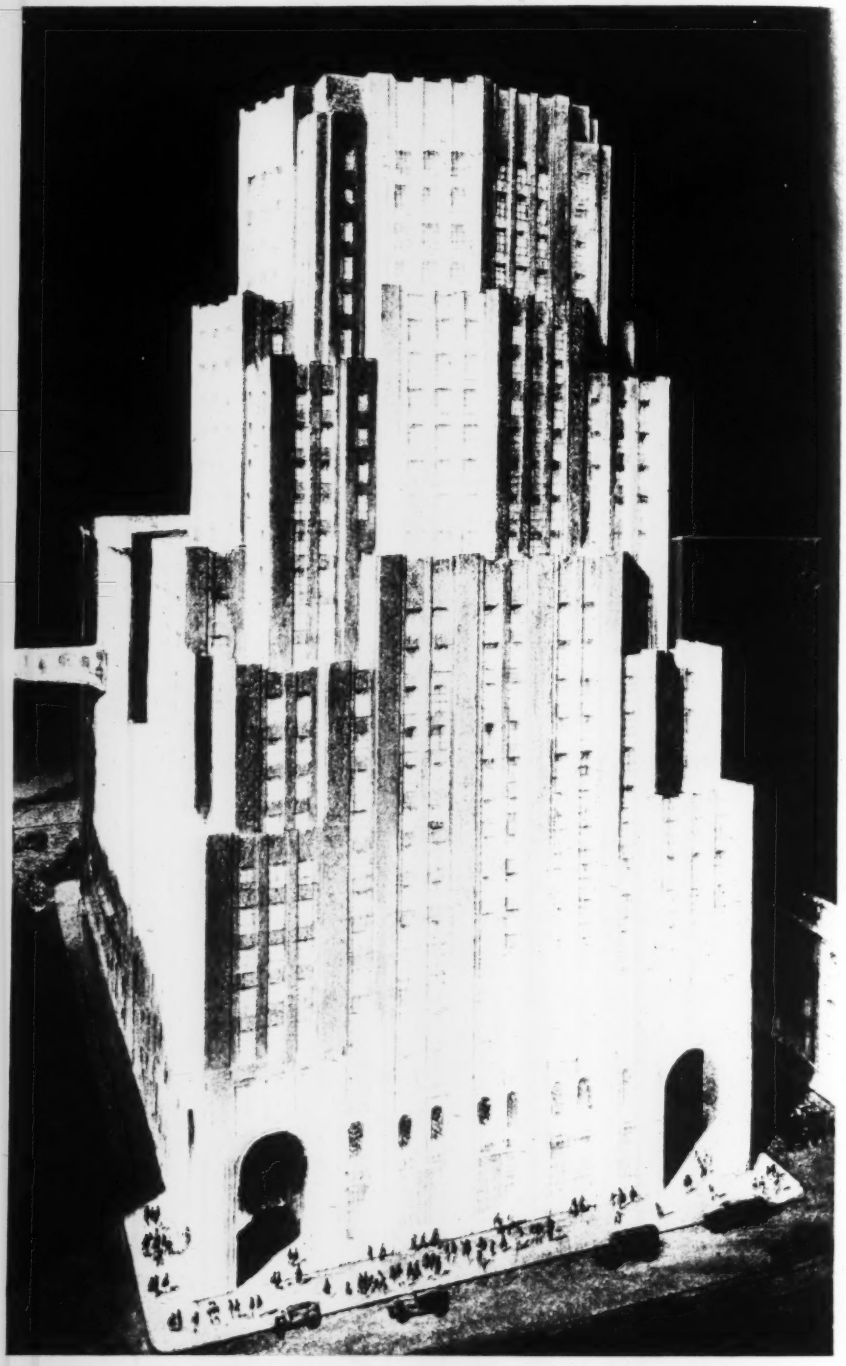
Welded Siphons on New Orleans Drainage System

Annual Convention of Steel Fabricators

Old jack-knife type movable bridges of B. & M. R.R. in Boston recently replaced by modern Scherzer spans

The Metropolitan Life Insurance Building

New York City



Architects: Waid and Corbett; Structural Engineers: Purdy and Henderson; Contractors: Starrett Brothers & Eken.

BETHLEHEM STEEL

FRAMEWORK of BETHLEHEM SECTIONS

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F. E. Schmitt, Editor

NOVEMBER 5, 1931

An Asset to Be Preserved

A REMARK worth thinking about was made at the structural steel fabricators' convention last week by Charles F. Abbott, secretary of the organization. "The great need of the present time," he said, "is preservation of the identity of the trade association movement." He had in mind, evidently, the loss of membership and money support suffered by industrial associations, his own among the number, in periods of low business. The American Institute of Steel Construction has had to curtail its activities drastically, many other associations even more so. When profits disappear the member companies naturally seek every possible expense reduction, and cutting off association dues is one of the easiest; yet such economizing entails serious loss. An industry depends on cooperation most vitally in times of depression and disorganization, and the industrial association is its only agency of cooperation. The very convention which Mr. Abbott addressed gave proof of this vital dependence, being wholly preoccupied with the problem of more effective cooperation and with discussion of activities all of which are intimately interwoven with association work. Allowing any association to decay or collapse under present conditions is a matter of grave concern; the time is just ahead when reconstruction will demand thorough cooperation, and then the machinery to accomplish it may be lacking. That machinery is an asset which should be preserved.

Adjustment Possible

OTHER remarks and discussions at the fabricators' meeting reveal a deeper split between structural-steel contractors and general contractors than had been suspected. We discussed the claim for segregated steel contracts at some length a few months ago (*ENR* June 25, 1931, p. 1037), at the time the New Jersey law was news. But last week's discussions show that quite widely throughout the country the steel men demand segregation of contracts, for reasons which may be summed up by saying that they have been abused by the general contractors. The complaints, as is well known, are chiefly two: that general contractors ask for steel bids before they put in their own bid, and again shop around for reductions in the bids after they have obtained the award; and that they fail to pay for the steel promptly even though the owner pays them, so that the steel man in effect is made to finance the general contractor. There is justice in these complaints. It should not be difficult to analyze them and find ways of getting over the difficulties involved, without setting up laws or establishing antagonistic trade practices. It should be practicable to decide on what kinds of steel contracts are inherently appropriate for segregated bidding, and to formulate fair trade practices as between the two interrelated industries. Probably both parties are partly right and partly wrong in their present attitudes. Adjustment of the differences by conference should be possible.

Engineering Antiques

IF ENGINEERING structures were not so big and cumbersome someone could earn the grateful thanks of the profession as well as everlasting fame by founding a museum for engineering antiques. Each year sees some famous and interesting landmark yield to the march of progress. And all too often posterity is left only with memories instead of facts concerning it. James Finley's suspension bridge near Pittsburgh, the Newburyport suspension bridge, cross-sections of the old Cumberland Road and the Philadelphia and Lancaster Pike, the masonry locks at Little Falls, N. Y., Burr's and Wernwag's wooden bridges, the trusses of Squire Whipple and Bollman, the Home Life Insurance Building in Chicago, all are pioneer engineering achievements upon which the modern engineer could gaze with profit, were they extant. These thoughts are suggested by the cover picture of this issue, which shows the old jack-knife draw-bridges that the Boston and Maine R.R. has recently retired from service. The first of these curious structures is said to have been built in 1835. Probably it was of wood, although iron and steel were substituted later. These bridges, consisting only of a lattice girder under each rail, with folding lateral bracing between, apparently never were used outside of New England. A brief search of the record does not reveal the original designer, or the source of the design or the name. Opening the pasture gate for the cows, a task which many of the early engineers must have performed many times, may easily have suggested a similar arrangement for passing boats through a bridge. However the design was originated, it proved useful throughout nearly a century in a busy railway terminal. Like its many contemporaries of an early engineering epoch, it is now forced to give way to products of the current period that more efficiently meet modern needs.

Jobs for Horses?

A CRAZE for hand labor on public construction is sweeping the country in the name of unemployment relief. Highway work is expected to bear the brunt of this inefficient and highly expensive procedure. For example, one state has decreed that teams and scrapers must be used on highway excavation, including one particular contract awarded on a bid based on a normally mechanized operation. Just why the decree stopped with teams and scrapers and passed up wheelbarrows and

hand shovels is not clear. Are horses in need of jobs? The plain fact is that handing every unemployed person a pick and shovel will do little to relieve the situation. If headstrong but shallow-thinking people insist on further disturbing normal construction procedure it will mean that before long those indirectly dependent upon construction work for a livelihood will be in line for a hand shovel. Work must be provided for all, but not work that penalizes the public in cost and not work that turns us back a century in construction progress and upsets established construction practices in a way to make the present bad conditions even worse.

Single-Track Roads

THE BRIEF for single-track paved roads published in this issue presents figures of current construction and maintenance costs which have not before been available to many highway engineers. It will surprise most of them to learn that so many miles of narrow pavements have been and are continuing to be constructed on rural highways. The explanation lies in the records of service which these dual-type roads are making. Whether this explanation will warrant ranking the combination of a half-width rigid pavement with dirt- or gravel-surfaced road as a general economic solution of the local road improvement problem may be doubted. To say the least, it will be difficult for most highway engineers to carry their belief so far. The single-track pavement has a natural appeal as an economic first step in the improvement of a road ultimately destined for full-width hard surfacing, but this step must be taken in logical manner. Obviously it is folly to carry a costly high-type construction over miles of low-type location, grades and curves. With due caution on the part of the reader as to such phases of the theme, the article deserves careful study.

Virtue in Simplicity

THE water-cement ratio is an element of concrete mix design procedure that has definitely demonstrated its usefulness since it was first proposed by Abrams more than a decade ago. The many current strength specifications attest to this fact. But there is still a large volume of concrete made without much regard for maintaining a correct water-cement relationship. Why this is so has not been entirely clear, but it may result from the fact that emphasis has been put on the water rather than the cement. The average contractor cannot understand this importance of water; to him the cement is the vital constituent of concrete. Water is merely a vehicle for making the mix plastic. If this conception can be held accountable for much poor concrete, perhaps the new relationship proposed by Inge Lyse, in which the cement is the numerator of the ratio, may prove to be a valuable aid. This relationship of cement to water by weight plainly shows that the strength of concrete increases directly with the increase in cement content per unit of water. Two points are enough to define the curve, in place of at least half a dozen as is the case with the logarithmic curve of the usual water-cement ratio. Other investigators have suggested substitutes for the water-cement ratio, but these have usually needed scientific analysis to be understandable. The great value of the cement-water ratio would seem to lie in its simplicity. Lyse's proposal deserves careful and wide consideration.

Stabilization by Quota

WHATEVER may be thought of the virtues and vices of the remarkable quota plan proposed by the structural steel industry at White Sulphur Springs last week, the frank public announcement of the plan is evidence of courage. It may be the courage of desperation, for business troubles have become hardly bearable, especially when the employer sees his idle workers in distress. But this courage deserves in return a thorough and sympathetic study of the plan.

The plan is one of cartellization. It lacks a definite price-fixing feature, but it goes far beyond those stabilization attempts that rely on mere exchange of production and market statistics. The latter course failed badly in some noted instances, as witnessed by the fierce cement price war that opened early this year. Instead of depending on this method, the structural-steel men propose to set up quotas and levy penalties for exceeding the quota. The penalties, being in the form of increased association dues, serve the general advance of the industry and are not used to reimburse the under-quota plant.

Questions of legality of the plan must be left to those skilled in the tricky arts of trust laws. But everyone is concerned to know whether the plan is in the public interest and may properly reflect on it in this light. Consumer and public have a large stake in any such proposal. They know that competition always has been and always will be the life of trade, and that striving to achieve something is man's motive power of progress; but they also know that beyond some undefined point competition becomes warfare, and that legislators as well as business leaders have failed utterly to prevent such warfare.

In practical terms, consumers do not want any industry given uncontrolled exploitation privileges, but they want it stabilized. Everyone hopes much from stabilization; that it will reduce the extreme swings of economic activity, that it will assure fair and uniform adjustment of prices, that it will give the worker security, and that it will maintain the reserve capacity necessary for adequate service. It is important, therefore, to view the plan from the standpoint of the public.

In normal times, no doubt, the plan would prove beneficial to operation and employment, by smoothing out the surges between plants and by reducing the effect of short-time business fluctuations on the psychology that governs prices and employment. But in extreme times, like those we are now experiencing, the plan might not help much; if it were in force today it would not add a single idle worker to the structural-steel payroll. In this respect the plan, though born of the depression, would not meet depression requirements. Again, its effect on prices, even in normal times, is not easy to forecast. But it may be assumed that the governmental supervision which any control plan inevitably requires would protect the consumer against excessive prices.

Let it be recalled that the fabricating industry is by no means badly off today. For quite a few years, including 1930, it has had a large volume of business, and even its 1931 tonnage is fully 60 per cent of the biggest year's tonnage in its history. This does not signify prosperity, however. For the fabricators have long complained of profitless prosperity, partly their own fault but basically the result of traditional habits of competitive warfare.

A real stabilization can be brought within range of possibilities if such a system is set up that fair-weather business earnings will yield sufficient profit to tide over

bad times, and if the profits are applied to that end. An unemployment reserve created in good times would be a central element in such a system. Stabilization plans directed toward this end will have a powerful claim on general support because founded on a public need, not merely an industry need.

Any business system that will reduce and relieve unemployment (or, what is equally important, the threat of unemployment), and at the same time perform the further function of maintaining the essential reserve capacity of an industry, has a compelling argument in its favor. It approximates that kind of industrial stabilization of which most people have been thinking. If the quota plan can be adjusted to these services, made amenable to the law and brought under effective public control without destroying its workability, it may bring a genuine advance in industrial cooperation. Without such orientation it is merely a plan to restrain competition; and until we reach that ideal state of knowing where desirable restraint ends and injurious restraint begins, legislators and courts are not likely to look on it with favor.

The Issue of Flood Protection

REVISION of the Mississippi River flood-control plan is a major problem of the new Congress which meets on Dec. 7. Many special claims and individual plans for improvement will be brought forward. Plans for higher levees, for storage reservoirs, for straightened channels and for various methods of diversion will be urged by strong advocates. But however puzzling and exhausting the task of choosing from these plans, it is not the fundamental task before Congress. That task is to decide and to write clearly into the flood-control law whether the nation shall commit itself to the policy of complete flood protection on the lower Mississippi. The present flood-control act and its methods of enforcement leave the question undetermined.

Following the flood of 1927 it was undoubtedly the definite intent of Congress to provide for the complete control of floods from Cairo south. This purpose had universal support throughout the nation. But the economic policies of the administration intervened to upset this intention. Clear indications appeared that no scheme of flood control would be recognized by the administration unless it remained within a narrow limit of cost—about $300,000,000. The effect of this policy was momentous.

Previously, two official agencies had been directed to study and prepare plans—the Corps of Engineers of the army and the Mississippi River Commission. They proceeded to the task along different lines. Holding as its foremost objective the provision of complete control, the Mississippi River Commission reported a plan calling for an expenditure of $775,000,000. The chief of the army engineers, apparently advised of the prescribed limits of cost, reported a plan estimated to cost $296,000,000.

In physical characteristics the two plans were much alike. The discrepancy in estimated costs was the striking difference, and in view of the proposed revision of plan the reasons are important. The commission plan called for more ample levees, extensive bank stabilization, and, most significantly, compensation for land damages and flowage rights. The plan of the army engineers drastically reduced the commission's levee and bank revetment work and virtually disallowed land damages in the two large west-bank diversion floodways. In minor provisions, as for spillway structures, the reductions were in like proportion.

In brief, the army engineers' plan provided for $296,000,000 worth of flood control; that of the Mississippi River Commission aimed at complete protection, with an expressed proviso that further studies be made to determine final plans while proceeding with a lesser plan to afford an increased measure of protection while plans for full protection were being studied. This open conflict of purpose did not come to the clear knowledge of Congress, however, and has never been settled. The time has come when it must be settled.

The administration policies were embodied in a flood-control bill containing the army engineers' plan, and that plan was accepted by Congress as a plan for complete protection, but with a saving clause: provision for a commission made up of the proponent of each plan and a third member, to decide upon the best plan. Without question the purpose of Congress was a thorough and careful weighing of the plans to insure the best and most complete flood-control system. This purpose was circumvented by as vicious bureaucratic methods as have ever been exercised in public-works administration. The army engineer plan was approved by the commission in every substantial particular except that the estimate of cost was increased to $318,000,000.

We give this brief review of history so that the nature of the flood-control act which has been in force three and a half years and now is coming before Congress for revision may be clearly appraised. The act was not, as Congress and the public had intended, a measure to give the valley complete flood protection. It was an act implying a purpose of complete protection but subordinating this purpose to administrative policies that defeated the purpose. Specifically these policies denied all damages in the two diversion floodways vital to the flood-control plan as conceived. This position was untenable in law and suits brought to contest procedure with the Boeuf floodway plans resulted in action by the courts which stopped work. Obviously no edict of those who administer the law can successfully deny the right of citizens to be compensated for property taken or damaged by flood-control works.

The present law implies a promise of complete protection and places responsibility of every nature connected with carrying it out on the federal government. If such a commitment is not intended, the first task of Congress in revising the law should be to make its intentions clear. The duty of the engineers is to present plans for complete protection or less-than-complete control as required by Congress; to compare the merits and costs of different methods, and to make such recommendations as they deem wise.

Determination of whether full or partial protection shall be undertaken or whether costs shall be borne by the nation or divided between nation and state or any other body is a duty outside of engineering. Engineering may not pretend to legislative functions, and it may not use its resources and privileges to confuse or defeat a legislative mandate, once this has been given. At present the Mississippi work is in a contradictory and confused state. To place it on an assured foundation, Congress must declare the purpose—partial control or complete protection—and direct its engineers to devise the plan of greatest efficiency and economy of total expenditure.

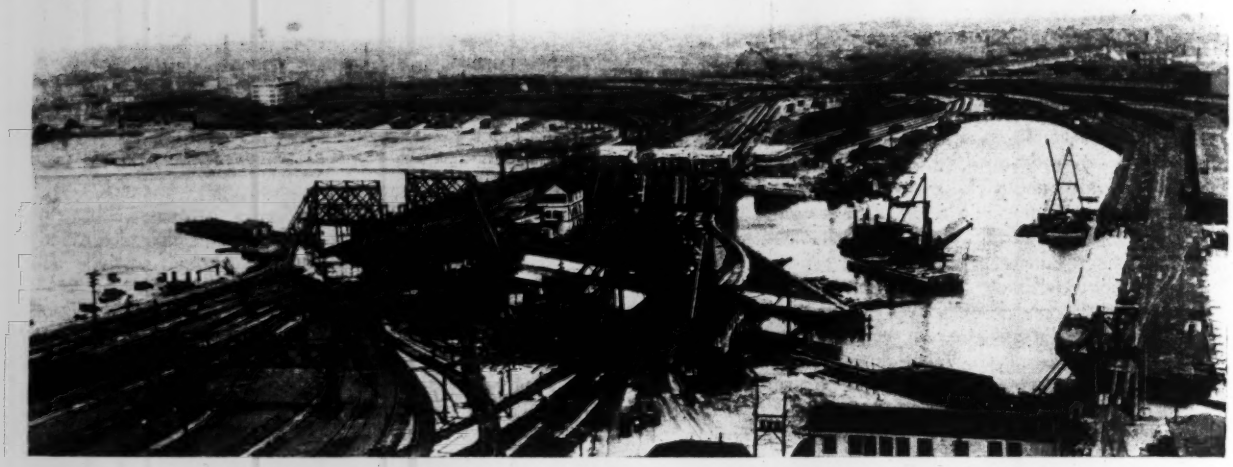


Fig. 1—Old bridges giving way to new structures, B. & M. terminal, Boston

Three of the old jack-knife draws are shown in foreground. Three of the ultimate four new bascules appear behind them. Trestle at extreme right is being removed to provide approach to the ship channel.

Rare Old Bridges Replaced in B. & M. Railroad Terminal Improvements at Boston

Six jack-knife-type structures dating back to 1835 give way to four single-leaf bascules—65 acres of trestle work removed—Construction and track changes carried on under heavy train traffic

SIX OLD-TIME true jack-knife movable bridges, probably the last of their rare type in the country, and nearly 3,000,000 sq.ft. (65 acres) of open trestle work have given way to modern structures and fills in the final step of the Boston terminal improvements made by the Boston & Maine Railroad. Four of the old bridges, spanning the Charles River, have been replaced by four single-leaf double-track bascules over a new channel; the other two, over Millers River, have been eliminated by a fill confining the stream to three 72-in. pipes 1,000 ft. long. A million and a half cu.yd. of fill now takes the place of the huge expanse of open trestle work formerly carrying the yard tracks adjacent to the passenger terminal.

All of the new construction, with accompanying multitude of track changes and shiftings, was carried on under the heavy traffic of 348 scheduled trains per day, all double moves because of the stub-end passenger terminal, making a total of 1,110 scheduled movements in and out of the terminal daily.

These changes are but a part of the terminal improvement program that has been under way for four years. The new North Station has been built with the novel inclusion of a coliseum, the Boston Garden (*ENR*, Feb. 28, 1929, p. 339). New freight yards, including an automatic hump layout, new coach yards, and a new 50-stall engine terminal are all included in the improvement program.

Originally the four main lines of the B. & M. Railroad that now enter North Station consisted of individual railroads, each with its own passenger station in the vicinity of the present terminal. These were: the Boston & Lowell Railroad, now the New Hampshire division of the B. & M.; the Eastern Railroad, now the eastern main-line route to Portland via Portsmouth; the original B. & M., now the western main-line route to Portland via Dover; and the Fitchburg Railroad, now the Fitchburg division of the B. & M. Each of these original roads had its own bridge over the Charles River; and two, the B. & M., and the Eastern, crossed the Millers River on similar structures. The locations of the old bridges, at the time of dismantling are shown in Fig. 3.

A brief history of each structure follows, the numbers corresponding to location numbers shown in Fig. 3.

All of the drawbridges, with the exception of the Boston and Lowell bridge (No. 5), were reconstructed about 1893 when the original North Station was built. The general line of these draws in Charles River was fixed, and their locations slightly changed in the year 1870. The Millers River bridges were altered about the same year. Before that time each railroad had its own bridge, built without much reference to the location of the other structures.

Drawbridge No. 1, Charles River—This bridge is approximately in the same position as the double-track bridge built in 1853, leading into the old Eastern Railroad station on Causeway St., and the two-track bridge built in 1856, leading into the first Boston and Lowell Railroad station on the same street. In final years this bridge carried eight tracks, and most of the passenger trains in and out of North Station were handled over it.

Drawbridge No. 2, Millers River—This bridge was approximately in the same position as the old Eastern Railroad bridge built in 1853. The Boston and Maine and Fitchburg railroads used in later. It was removed in 1927, when the channel was replaced with pipe conduits.

Drawbridge No. 3, Charles River, and Drawbridge No. 4, Millers River—These bridges are on the location of the Boston and Maine Railroad Extension Co. of 1844. Improvements were made on them in 1869 and again in 1887. Bridge No. 4 was eliminated by the installation of pipe conduits.

Drawbridge No. 5, Charles River—This was the Boston and Lowell Railroad bridge. The original bridge was authorized in 1832 and was opened to traffic June 26, 1835. The bridge was used for both passenger and freight traffic until 1857, from which date it was used for freight only. Between 1835 and 1905 various alterations were made to the old bridge. When the Charles River dam was built (about 1905) the old bridge was removed to a point downstream from the original location.

Drawbridge No. 6, Charles River—This was the old Fitchburg Railroad passenger bridge, originally built about 1847 for two tracks. A third track was added later, these tracks leading directly into the old Fitchburg Railroad stone passenger station on Causeway Street. In later years this bridge carried but one track.

In general, the original design was adhered to in altering the old bridges from time to time. Each track rail was carried on an independent girder, hinged on a vertical pin at one end. The girders, connected by S-shaped struts, were unequal in length to permit folding. The opposite end of the girders rested on shoe plates on top of the pier. Usually the girders were assembled in sets of four, carrying two tracks, with one or two sets making up a separate bridge. When a draw was to be opened, cables passing over a timber frame at the fixed-end pier to a cradle near the free end of the girder lifted each set off the shoe plate. A rack-and-pinion arrangement then swung the girders around clear of the channel, a true jack-knife movement. To the very last cable lifts and swinging racks were air and steam-operated.

Millers River Conduits

One of the first steps in the improvement of the terminal yards was the filling in of the old Millers River channel, no longer used for navigation, extending for 1,000 ft. across the yards, connecting Charles River with the Millers River tidal basin. To provide drainage for the basin, three elliptical concrete pipe conduits, 68x74 in., were laid in the bottom of the channel before it was filled in. This improvement eliminated the two original Millers River jack-knife bridges (Figs. 3 and 4).

Because of a constant varying water depth from 6 to 16 ft., depending upon the tide, shallow clearance under the bridges and restricted width of the channel at several points, pipe laying by usual methods would have been difficult. Instead, the contractor floated and sunk the pipe in multiple sections into place, a procedure made possible by the use of an ingeniously devised collapsible wooden bulkhead placed in the end of sections of pipe. Three parallel lines of pipe, of four to twelve 6-ft. sections of pipe, were built up on a raft. The assembly was towed to place and sunk with the aid of a falling tide and by flooding. Although the pipe was the bell-and-spigot type, special end sections with part of the bell removed permitted the pipe lines to be dropped vertically into place, tight against the adjoining lines already in place.

When the pipes had been landed, a pull on a line collapsed the bulkheads and brought them to the surface.

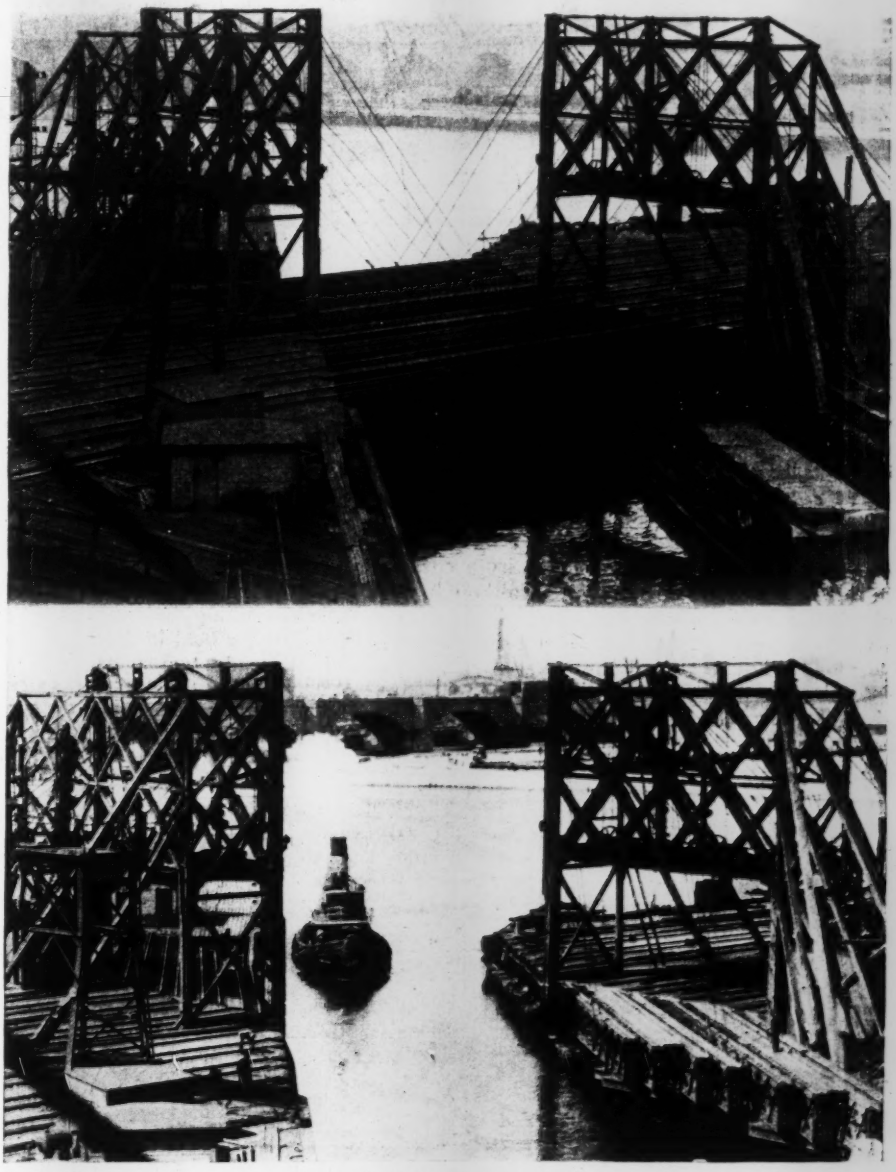


Fig. 2—This type of jack-knife draw has served Boston for 96 years

Two of the old structures over Charles River, which have now been eliminated.

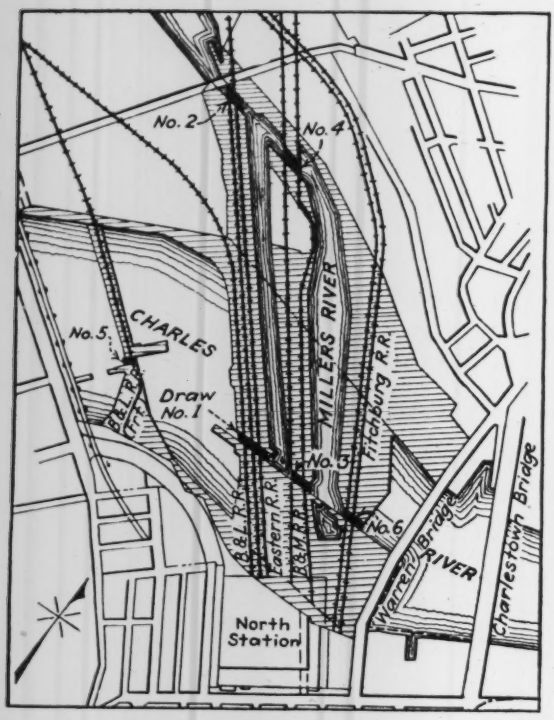


Fig. 3—Location of old drawbridges

The four separate railroad lines shown are now part of the Boston & Maine system. Original trestlework indicated by shading.

Flooding of the pipes was controlled by a small valve in the bulkhead, operated by a rod extending above water. Previous to laying the pipes, the channel bottom was leveled off with a bed of gravel. The raft timbers were not removed, being left in place as a cradle to hold the pipe lines to permanent grade and alignment.

Filling and Channel Changes

Filling-in of the old trestle work was begun in 1928. Most of the filling material came from cutting down a hill adjacent to the freight yards, although considerable city building debris was used, especially in the old Millers River channel. Excavation from the freight-yard hill was loaded into gondola dump cars. Material was sluiced into place by a jet from an old fire-engine pump. When the fill approached grade, clamshell buckets were used for unloading.

The results of years of maintenance on the old timber trestles can be seen from Fig. 7. No treated timbers or piles had ever been used. Piles had steadily deteriorated, requiring frequent building up, until several feet of blocking and cribbing were piled on top of the caps. Such structures became difficult and expensive to maintain. In the filling process the timber blocking was removed, but no piles were pulled.

Prior to the start of the improvement program the Charles River occupied a wide waterway through the trestle work, although its navigation channel was but 35 ft. wide from fender to fender. The original Fitchburg Railroad approach had been converted to industrial lead tracks, carried on trestles separate from and east of the main yards. These tracks were eliminated in the improvement, the old trestle torn out and not replaced by a fill.

The old Charles River channel was entirely too narrow for modern navigation requirements. It cut across the railroad property on a sharp skew for a distance of 450 ft., being located adjacent to the terminal trainshed. A new navigation channel 65 ft. wide was dug some distance north of the old channel, far enough away from the station proper to allow the terminal tracks to converge into eight main leads crossing the four new bridges. As these bridges are side by side, the new channel is only 110 ft. long, with one 50-ft. wing fender on each end. Removing the old Fitchburg Railroad trestle now provides a wide approach to the channel from the east or bay side.

Changing the channel location also permitted the construction of the four new bridges clear of the old bridges and channel. New U. S. pierhead and bulkhead lines established an open waterway 375 ft. wide through the railroad property. Outside of the main bridge structures the tracks are carried across the waterway on new timber trestles, all piling and timbers being creosoted. Fig. 4 shows the area of the old trestles removed, the limits of the new fills, the old and new channels, the new waterway, the location of the new bridges, and the Millers River conduits.

Design of New Bridges

The four new bridges are double-track, single-leaf, rolling bascules, with skew ends (Fig. 5). They are identical in design except for length and degree of skew ends, two spans crossing the channel at a slightly greater skew than the other two. The spans are made up of through-trusses, 31 ft. c. to c., varying in length from 88 ft. to 118 ft., c. to c. bearings.

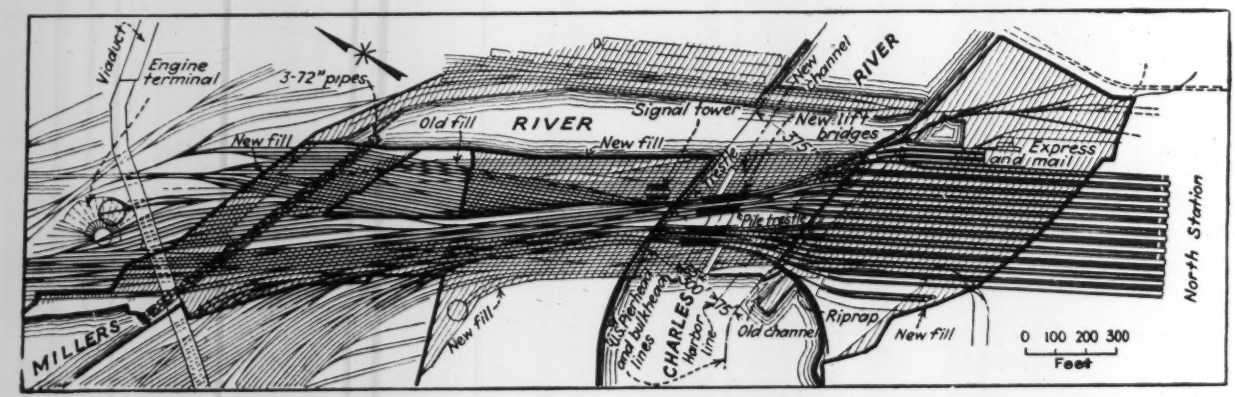


Fig. 4—General plan of terminal yards after improvements were made

Extent of old trestlework, now all removed, shown by cross-hatching. Limits of new fills shown by heavy lines.

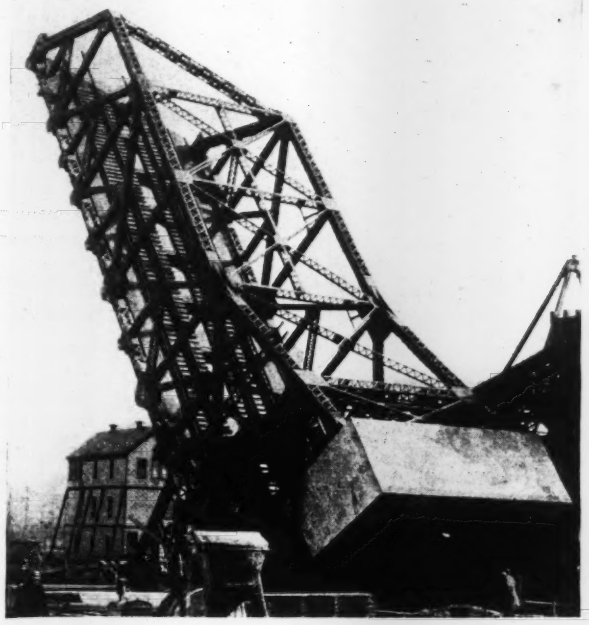


Fig. 5—One of the four new bascule spans

Each span carries a single 629-ton overhead counterweight, made up of concrete loaded with steel punchings, weighing from 148 to 290 lb. per cubic foot. In addition, each counterweight is provided with 45,000 lb. of removable concrete blocks, weighing 183 lb. per cubic foot, for adjusting purposes.

All erection was done with two locomotive cranes, working alongside the spans, which were erected on falsework. The railroad company's wrecking crane assisted in handling several girders weighing 58 tons each. Dimensions of the bridges are shown in Fig. 6.

Both the trunnion and rest piers are founded on circular caissons, from 6½ to 9½ ft. in diameter, sunk in the open 35 to 53 ft. deep. In three cases two of these circular caissons were combined into 8x20-ft. caissons.

Track Changes and Schedules

A carefully planned schedule of track changes provided for two major and ten minor shifts. The first major shift was made to permit the construction of the new spans. During the second major shift the new channel was dredged out, the old channel filled in, new trestles built and the tracks placed in final position across the new bridges. The river was closed to navigation for five days at this time. Besides these two main moves there were ten general shifts, all scheduled in advance to the smallest detail. During these changes, the tracks were shifted from trestles to fills. In addition to the general moves, individual tracks were constantly being changed. Despite the many track changes, full signaling and tower-control equipment was maintained at all times. A special train master was assigned to the work of coordinating track moves, train movements and the various construction operations.

The final track layout provides for 23 stub-end tracks at the terminal station. These converge into eight across the new bridges, then spread out into four double-track main lines, through coach and suburban coach yards, and an engine terminal yard. All curved rail, including the switch leads, in the terminal yards is 130-lb. heat-treated steel. These rails were bent, drilled and marked at the mills for specific locations. All frogs are solid manganese, self-guarded.

One new interlocking tower controls all switches in the terminal yards. This tower, of brick and steel, replaces an old frame structure. It was necessary to move the old tower 35 ft. without interrupting service. About 35 ft. of slack was cut into each of the 640 wires leading from the tower. The building was then jacked up, skidded to another location and operated until the new tower was completed. All signals in the terminal yard are the color-light dwarf type, electric-pneumatic operated. Signal and switch stands are concrete, precast by the railroad at its Concord, N. H., concrete plant.

Personnel

Engineers—The entire terminal equipment is under the direction of W. J. Backes, chief engineer of the B.&M. Railroad. W. F. Cummings, assistant chief engineer, is in charge of design. H. F. Fifield, engineer maintenance-of-way, T. G. Sughrue, division engineer, and J. F. Talbot, track supervisor, were in direct charge of the work for the railroad. E. W. Wiggin, New Haven, is consulting engineer for the B.&M. The

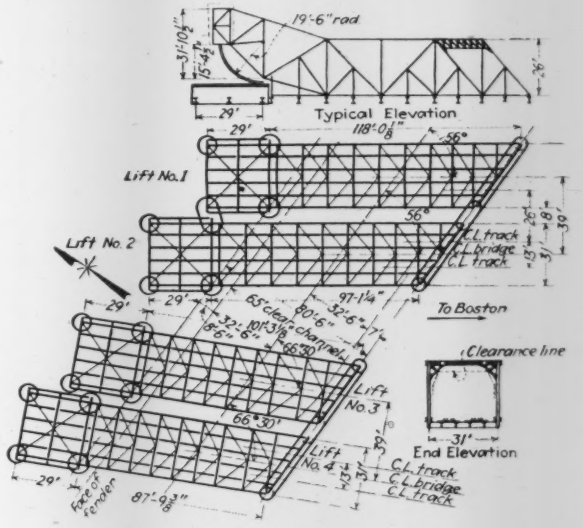


Fig. 6—Plans and sections of the new bridges

Fig. 7—Maintenance of 65 acres of trestlework in this condition was difficult and expensive

bascule bridges were designed by Keller & Harrington, Chicago.

Contractors—All channel dredging was done by the Bay State Dredging Co. The Phoenix Bridge Co., Phoenixville, Pa., furnished and erected the bascule spans, under the supervision of W. C. Bearce. The contracts for the Millers River conduits, the new bridge substructures and concrete seawalls, and new pile trestles were held by T. Stuart & Sons Co., Boston, with F. H. Stuart in charge.

Blotting Paint With Sawdust Cuts Striping Costs

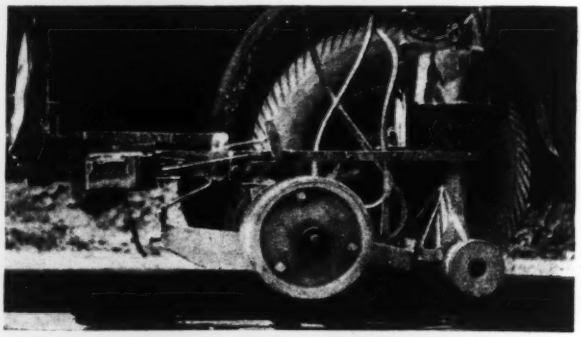
New device sprinkles sawdust behind sprayer nozzle—Counter measures length of stripe painted

By A. K. ERB
Senior Assistant Engineer, District Four, State Road Commission, Clarksburg, W. Va.

A NOVEL method of highway striping was developed in District 4 of the West Virginia state road commission during the early summer months of this season. The unique features include an automatic device for blotting the stripe with sawdust immediately following the application of the marking paint, and a counter for measuring the linear feet of stripe painted. The method had been to follow the pneumatic striping machine, which is a part of the present equipment, with a light truck and two men placing red flags and blocks to guard the stripe until the paint had dried.

The sawdust blots the paint sufficiently to allow traffic to cross or drive upon the stripe without causing excessive smearing and has little or no detrimental effect upon the visibility of the line. A comparison of the cost and speed of the two methods is shown in the table.

The averages are for a nine-hour day and include delays incident to weather conditions, breakdowns, etc. The cost of sawdust is added to 1931 costs because it is a cost in addition to the 1930 charges. Equipment rentals for 1931 are presumed to be identical with those of 1930, which is sufficiently accurate for the comparison.



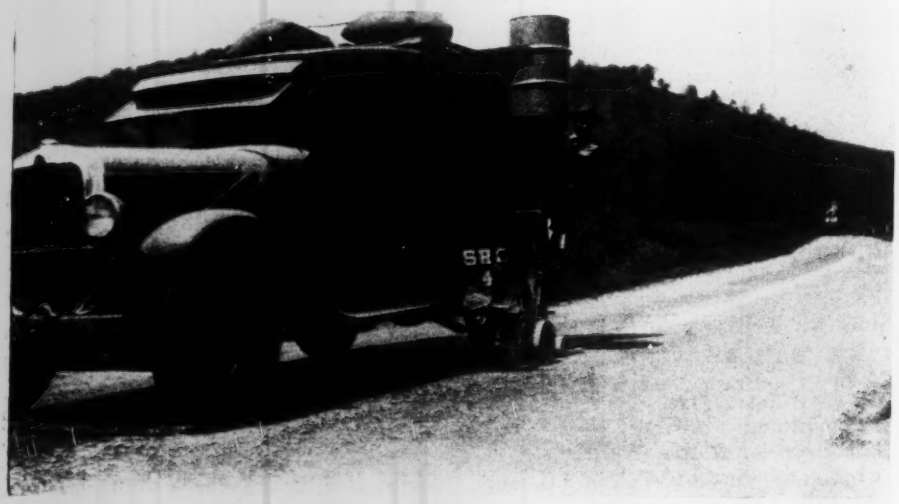
Working parts of paint spray and sawdust blotter

Further study of the efficiency of the machine, made possible by the attachment to the truck of a recording device that makes an indelible record of the time spent in actual operation, reveals that the possible peak production may be increased to nearly three times the average shown for 1931, this efficiency being possible without appreciable increase in labor and equipment cost. The addition of a mechanical device for stirring the paint and an additional spray gun attached to the striping machine is expected to accomplish the desired result.

COMPARISON OF COST AND SPEED OF TWO METHODS

1930 Organization	
1 1-ton truck and operator	$9.30
1 highway striper and operator	8.25
1 ½-ton truck and operator	6.20
2 laborers	6.30
	$30.05
Average day's work	14,000 lin.ft.
Labor and equipment cost	$0.00214 per ft.
1931 Organization	
1 1-ton truck and operator	$9.30
1 highway striper and operator	8.25
250 lb. sawdust at 0.005	1.25
	$18.80
Average day's work	20,000 lin.ft.
Labor and equipment cost	$0.00094 per ft.

The development of the apparatus for distributing the sawdust required considerable experimenting. Three different types of compressed air-operated nozzles were tried and discarded in favor of a mechanically operated screw-type distributing nozzle and gravity feed to the screw. On account of the relatively small apertures that were found to be necessary to prevent the use of an excessive amount of sawdust, it became obligatory to provide some means of controlling the tendency of the sawdust to clog in the feeding chambers. This difficulty was overcome by an agitator in the small funnel directly above the distributing nozzle. The agitator consists of a short piece of $\frac{5}{8}$-in. No. 8-gage flat iron twisted to form an auger and actuated by a vacuum-type windshield wiper. Compressed air is supplied to the windshield wiper from the supply tank of the spray machine. Commercial screened sawdust No. 16 to No. 18 was used to facilitate control further.



Stripe painting truck fitted with sawdust blotter

Cement-Water Ratio by Weight Proposed for Designing Concrete Mixes

Water-cement-ratio strength expressed by logarithmic curve—New relationship is nearly a straight line—Cement-water ratio is simpler expression of quality of cement paste than water-cement ratio

By INGE LYSE
Research Assistant Professor of Engineering Materials, Lehigh University, Bethlehem, Pa.

THE EFFECT of the quality of the cement paste on the strength of concrete has long been recognized. Ordinarily the water-cement ratio has been used as a measure of the quality of this paste, and the relation between the water-cement ratio and the strength of concrete has been given by a logarithmic equation. If, however, the cement-water ratio is used instead of the water-cement ratio, the strength-ratio curve becomes nearly a straight line. This phenomenon is illustrated in the accompanying diagrams and was discovered by the writer during the preparation of a paper for European publication, written in metric units. It was noted that the water-cement ratio expressed in liters of water per kilogram of cement was rather awkward, while the inverse term (kilograms of cement per liter of water) was much better. Plotting the Abrams and Talbot-Richart curves to the cement-water ratio by weight basis gave nearly a straight line of opposite inclination to the more usual water-cement-ratio curves.

In Fig. 1 the left-hand diagram is taken from Fig. 1 of Slater's paper, "Designing Concrete for High Strength, Low Permeability and Low Shrinkage" (New International Association for Testing Materials, 1931), and is a comparison between Abrams' and Talbot-Richart's curves for the strength of plastic and workable concrete. In the right-hand diagram the same curves are shown plotted to the cement-water ratio by weight. It is noted that both curves become nearly straight lines when the cement-water ratio is used to indicate the quality of the paste. In Fig. 2 the left-hand diagram is taken from Fig. 1*A* of Gonnerman and Woodsworth's paper "Tests of Retempered Concrete" (*Proceedings*, American Concrete Institute, Vol. 25, 1929), and is an excellent illustration of the water-cement-ratio-strength relation for concrete at different ages. The diagram at the right shows the same data plotted on basis of the cement-water ratio by weight. The straight-line relation between the strength of concrete and the cement-water ratio by weight is seen to hold for all ages that are included.

The strength of concrete may therefore be expressed by the formula:

$$S = A + B\,(c/w)$$

where A and B are constants depending upon the materials and conditions of tests and c/w is cement-water ratio by weight. For a given type and grading of aggregates it was shown in Slater and Lyse's paper "Compressive Strength of Concrete in Flexure as Determined From Tests of Reinforced Beams" (*Proceedings*, American Concrete Institute, Vol. 26, 1930), that the amount of water per unit of concrete of a given consistency remained practically constant for concretes of different richness, and the equation reduces to:

$$S = A + B(c/w) = A + Kc,$$

where A and K are constants and c is cement content per unit of concrete.

Therefore, the strength of plastic and workable concrete may be considered, depending upon the concentration of cement particles in a unit of water, in such a way that the strength increases directly in proportion to the increase in cement content per unit of water. If the water content remains constant per unit of concrete, the strength increases directly in proportion to the increase in cement content.

An important significance of the relationship shown is the recognition of the fact that the cement is the strength-giving element in concrete. Above a given minimum amount of cement particles necessary to give

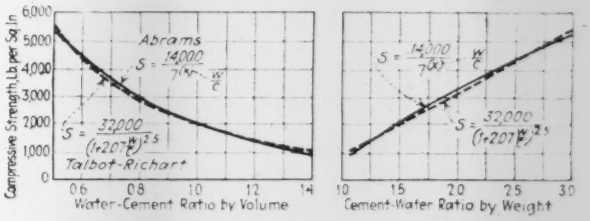


Fig. 1—Comparison of water-cement ratio and cement-water ratio relationship in terms of two well-known series of data

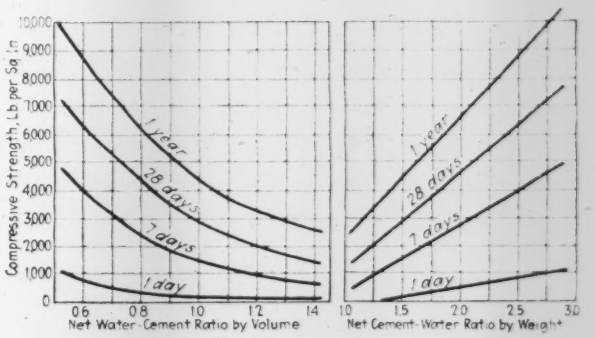


Fig. 2—Strength of concrete at different ages on basis of water-cement ratio and cement-water ratio

binding strength to the concrete, the strength increases in direct proportion to the increase in number of cement particles in a unit of water.

The writer does not know of anyone having previously proposed to use the cement-water ratio by weight as a basis for concrete studies. The nearest to it is the old Feret's and the later Talbot-Richart's cement-void ratio by absolute volumes (Fig. 7, Bulletin No. 137, University of Illinois). Another closely related relation has been given by Bertin (*Proceedings*, A.C.I., Vol. 26, 1930, p. 677). Mr. Bertin uses the relation between strength of concrete and specific gravity of the paste. As a matter of fact, the specific gravity of the paste is approximately proportional to the cement-water ratio by weight. It is rather strange that the simple relation between weight of cement and weight of water has not formerly been considered, while the more complicated but closely related relations on the basis of absolute volumes and voids and of specific gravity of the paste have been widely studied.

A prominent saving in using the cement-water relationship is made posisble by the straight-line relation, because two well-established points will determine the entire strength-*cement-water*-ratio relation, while four or five points are needed to establish the curved strength-*water-cement*-ratio relation. Where the type and grading of the aggregates are such that a given amount of water per unit of concrete gives practically constant consistency, regardless of mix, a further saving is made possible by the fact that one trial mix will determine the approximate consistentcy of all mixes, while otherwise one trial mix is necessary for each richness of concrete.

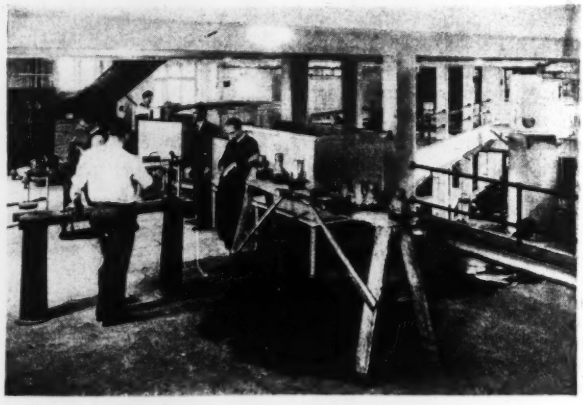
New Hydraulic Laboratory at University of Tennessee

Unusually complete range of equipment for hydraulic study included in new engineering building

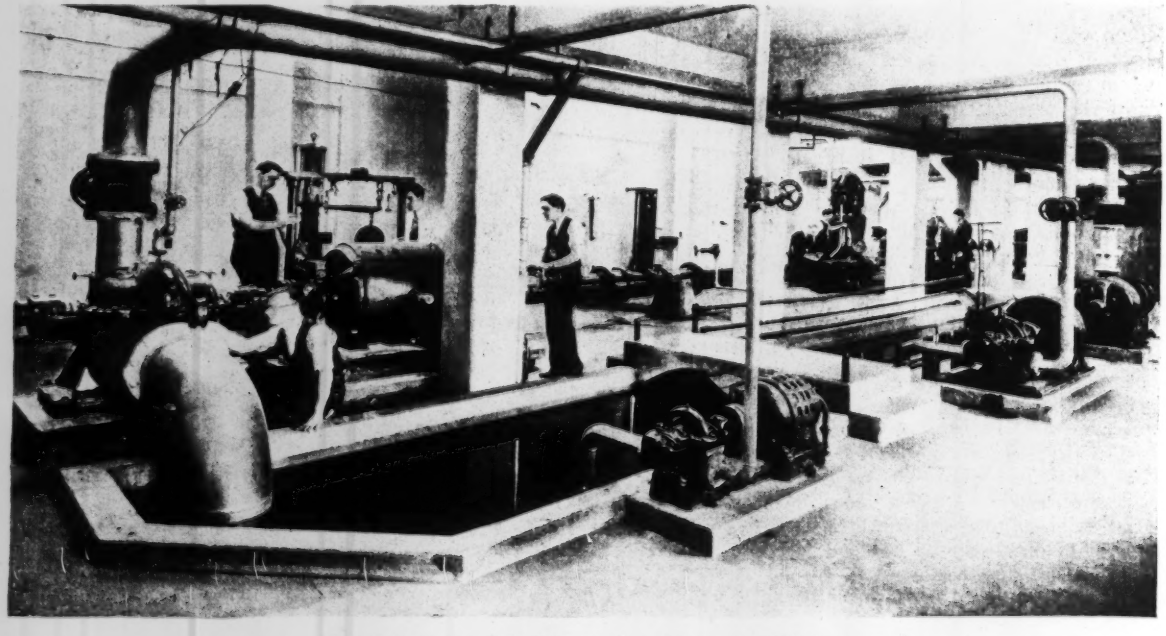
HYDRAULIC laboratories occupying half of two entire floors of Ferris Hall, the new engineering building of the University of Tennessee, at Knoxville, Tenn., are a notable addition to the facilities for practicable hydraulic studies in the South. Designed primarily for use by the students of the university the laboratories will serve also for research work in hydraulics.

There are two laboratories, one above the other, arranged for independent work but having some facilities in common. The lower or senior laboratory has a floor space of 3,600 sq.ft. Its principal feature is a canal 6 ft. wide, 6 ft. deep and 76 ft. long occupying the center of the floor. Bordering it are pumps of various characteristics, so mounted that they can take water from the canal and discharge it either into the weighing tank that serves both laboratories, into a pressure tank, or into a surge tank that constitutes part of a hydro-electric assembly. At one end of the canal is located a centrifugal pump designed to discharge 5,000 gal. per minute against a head of 22 ft., or 2,000 gal. against a head of 36 ft. The direct discharge of this pump is through a 14-in. pipe into the surge tank, but it may be discharged into the laboratory header. Between the pump and the surge tank is a hydraulically operated gate valve with remote control, and from the surge tank a 14-in. spirally welded steel penstock leads to a vertical turbine fitted with a direct-connected generator of special design. A 14-in. venturi meter has been placed in the penstock for measuring the water used by the turbine. Further measurements may be obtained by a 5-ft. suppressed weir in the tailrace.

The surge tank is 5 ft. in diameter and 22 ft. high. It has two unusual features: an automatic siphon overflow that can be adjusted to limit the height of the surge, and a removable differential riser. The riser has adjustable ports, and it is so built that it can function over a wide range of conditions. The whole assembly is arranged so that commercial conditions in hydro-electric production can be simulated and a careful check made of the



Junior laboratory on mezzanine above main laboratory



Main laboratory with 6-ft. canal and pump installation

quantities of water and power. The turbine is served by an oil-pressure governor of the most modern design.

Located at the other end of the canal is a five-stage centrifugal pump taking water either from the canal or from the city main under high pressure. When on suction lift the pump generates a head of 450 ft., and when acting as a booster for the city pressure a head of 700 ft. is built up. The discharge from the pump goes to a specially designed pressure tank. One connection from this tank leads to a 12-in. Pelton-type waterwheel; the other is available for high-pressure work anywhere in the laboratory.

The junior laboratory occupies a mezzanine floor overlooking the senior laboratory. It has floor space of 2,600 sq.ft. In it are located facilities for weir and orifice measurement and for testing various types of meters. Weighing tanks with hydraulic-laboratory beams are provided. The main weighing tank, serving both laboratories, has a capacity of 600 cu.ft. It is mounted on a 60,000-lb. platform scale with weighing beams located on each floor. When used as an adjunct to the junior laboratory the discharge of water from weirs or other devices under test can be discharged into it.

All the principal pipe lines in the laboratory are welded. Tube turns instead of elbows are used in these lines.

The laboratories are operated under the supervision of J. A. Switzer, head of the department of hydraulics and sanitary engineering of the university.

Earthquake-Proof Dam in Chile

THE COGOTI DAM is one of eighteen dams on which work is in progress under the national reclamation act of Chile. Seventeen of these dams are of the general design illustrated. This design is earthquake-resisting and is based on two principles: (1) building a rockfill that will not flatten further under shock; and (2) making it watertight by a slope pavement that will flex without rupture. The height and slopes of the fill vary at the different dams, but in all dams they were arrived at by a long and careful study (including measurements) of rock slides in the district.

Fig. 2 shows the general structure of the Cogoti Dam. It consists of a main fill of side-dumped rock, an auxiliary fill of rock end dumped against the slope of the main fill, a thick surface fill of gravel and a laminated concrete pavement. All parts of the fill are dumped; there is no hand- or derrick-placed material. The concrete pavement required the usual care in construction that must be given to this class of concrete work, but for the fill proper no special machinery was necessary nor extreme care in construction.

Starting with the natural slope of the dumped rock, the auxiliary stone fill, the gravel fill and the pavement have increasingly flatter slopes. All stresses in the paving are therefore compressive, and no reverse stresses occur. If there is disturbance of the rockfill by settlement of earthquake shock, the thick bed of free-running gravel is expected to fill the depression with very slight change of surface next to the pavement. The pavement construction is shown in detail by Figs. 1 and 3. The laminated construction is particularly to be noted. This, with the division into slabs (but with continuous reinforcement) and flexible water stops, provides exceptional possibilities of readjustment by bending and slipping movement, without impairing the watertightness of the surface lamination.

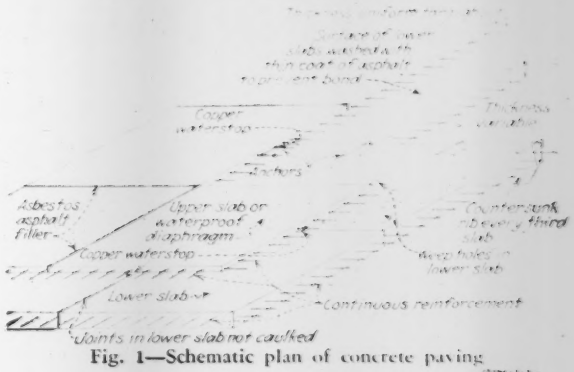


Fig. 1—Schematic plan of concrete paving

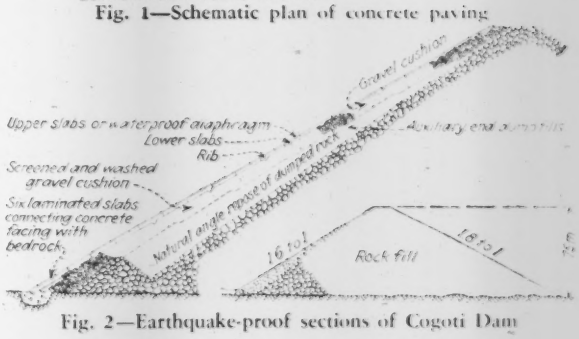


Fig. 2—Earthquake-proof sections of Cogoti Dam

The dam contains 760,000 cu.yd. of rock. It was designed by James B. Girand, consultant to the Chilean government, who also designed the seventeen other dams. The contract for construction was let to the J. G. White Co., of which L. H. Huntley is general manager. The contract price was slightly over 8 million pesos, or $1,000,000. The active work is under the direction of Mr. Moore, their local superintendent, and the engineering is directly under the department of reclamation.

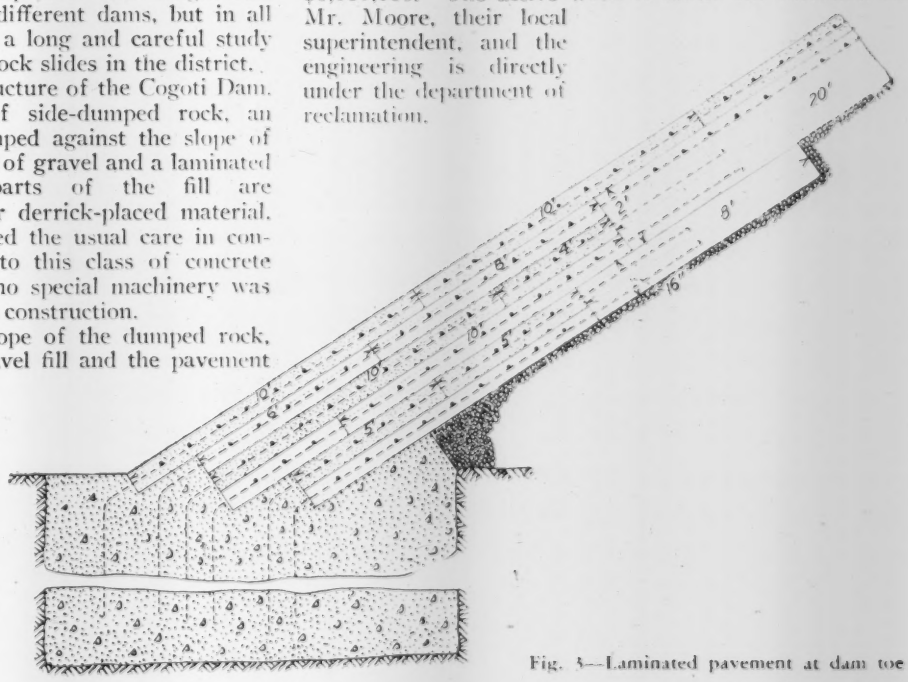


Fig. 3—Laminated pavement at dam toe

Single-Track Concrete Highways

A survey of the place of single-track concrete pavement in local road improvement with records of maintenance costs, by engineers of the Portland Cement Association

WITH MORE THAN 2,600 miles of single-track concrete pavement constructed since 1910 in 27 states and 170 counties, this practice of meeting a local road problem commands earnest attention. In the following articles argument for this type of road and records of its performance, as found in a survey by engineers of the Portland Cement Association, have been epitomized for *Engineering News-Record*. The result is of importance as a record of a distinctive phase in American highway practice. Specifically, the cost figures will be found useful in comparing single-track concrete pavement with other construction types demanding consideration in the coming major task of county highway improvement.—EDITOR.

I—Cost and Serviceability

By F. M. FLEMING
Manager Highways and Municipal Bureau, Portland Cement Association, Chicago, Ill.

THERE are many counties that do not have the finances to institute a road-improvement program of any magnitude. These counties are outside the scope of consideration just as are counties that have large resources. The first is hopeless, at least for the present, and the second class is well able to take care of itself. In between these extremes, however, are many counties of moderate resources, either actual or potential.

Cameron County, Tex.; Onondaga County, N. Y.; Kent County, Md.; Huron County, Ohio; Champaign, Vermilion and Iroquois counties in Illinois; Bay County, Mich.; Mississippi County, Mo.; Dyer County, Tenn.; Matagorda County, Tex.; Clackamas County, Ore., and many others have built relatively complete systems of local roads by the use of funds derived from their own resources. In several cases funds from state sources have been used to some extent, but this aid usually came after the county had started the construction of its system on its own initiative. In each case also the county has used single-track concrete roads, either wholly or in part, to extend its surfaced road mileage as far as possible.

Heretofore very little study has been given to the single-track road. It has been accepted as a solution of local road problems in certain areas simply because it presented obvious advantages. Others have felt that it possessed disadvantages that outweighed the advantages. Observation of many miles of these roads in actual use indicates that the disadvantages are more apparent than real, and that the advantages are so great that they must be given serious consideration in any attempt to secure greater road service from available highway funds. The advantages are that single-track roads offer every service, except two tracks, of any paved road. The apparent disadvantages are:

1. The first cost is generally higher than the low-type surface usually recommended for county roads.

Single-track concrete road in Kent County, Md.
A part of the 51-mile system of roads 9 ft. wide with slag shoulders.

2. A one-lane road appears to present elements of danger, in meeting and passing other vehicles.

3. The one lane appears to be an incomplete road.

4. Shoulder conditions, particularly when they are of earth, seem to present driving difficulties to those not familiar with traffic customs on these roads.

Costs—The cost of single-lane roads will, of course, vary widely for different conditions and in different sections of the country. Generally it will run from $10,000 to $18,000 per mile, including grading and draining. It will also vary because of the type of shoulder used. Probably $12,000 to $15,000 per mile would represent average conditions.

At the recent letting in Porter County, Ind., the average cost per mile complete was $9,766. This included a 9-ft., 9-6-9-in. slab, and a 5 ft., 4-in.-thick traffic-bound macadam shoulder on one side. Awards in Vermilion County, Ill., were made this year at an average cost per mile of $14,800 for a 10-ft., 9-6-9-in. slab, with 6-ft. gravel feather-edged shoulders on each side. In Iroquois County, Ill., 5 miles was awarded recently for $12,500 per mile complete. Earth shoulders were used. On May 7, 1931, 17.7 miles of 9-ft. road with earth shoulders and a 9-6-9-in. section was awarded by Champaign County, Ill., at an average price per mile of $12,562. Pierce County, Wash., on May 7, 1931, awarded 3.6 miles of 9-ft. single-track concrete, with a 9-ft. gravel shoulder on one side, for $10,000 per mile. A 9-6½-9-in. slab section was used. In Bay County, Mich., awards this year average $9,600 per mile with earth shoulders, but gravel will be applied later.

These figures and others show that the single-track concrete road, while costing somewhat more than most

types advocated for this field, still leaves it very much within the reach of justifiable expenditures.

Passing—The second objection to single-track concrete roads is that these roads present elements of danger when meeting and passing other vehicles. Observation indicates that this objection is more fancied than real, for the local users soon develop a custom of use that allows them to pass with a minimum of trouble and inconvenience. The stranger, if he is observant and also is not a road hog, soon learns the necessary procedure.

Observation of 150 miles of single-track roads in Champaign County, Ill., shows that the traffic averages between 300 and 500 vehicles per day and that the accident rate is no greater than on the two-lane roads. On days when football games are scheduled at the University of Illinois, as many as 500 vehicles per hour have been counted on some of these roads. Most of this traffic is traveling one direction, of course. In Missouri the 1928 traffic survey revealed daily traffic volumes running from 300 to 1,600 vehicles per day and maximum daily traffic volumes considerably higher. In Mississippi a traffic survey in 1929 showed eight sections of single-track concrete averaging 1,200 vehicles per day.

It can be granted that roads carrying traffic volumes of more than 500 vehicles per day should be widened, but the fact that these roads are carrying these heavy volumes, and apparently without undue danger, is proof that at the least their potentialities for causing accidents are not nearly so great as it might seem.

Adequacy—The third disadvantage cited was that the one-lane road appears to be an incomplete road. It can be shown that it is not. It was previously stated that 500 vehicles per day should be considered as about the maximum for a single-track road. For a ten-hour day this averages 50 vehicles per hour. Using 50 per hour, or 25 in each direction, computations can be made to determine the efficiency of a single-track road in supplying a surfaced roadway. At 30 miles an hour, one vehicle in an hour would pass 50 other vehicles going in the opposite direction, since they are approaching each other at 60 miles per hour. In other words it woud make 50 turnouts in 30 miles.

Field observations show that about 120 ft. is required for one car to turn out and return to the slab in passing an approaching car having the right-of-way, so the 50 turnouts will require 6,000 ft. of shoulder traveled. During this hour the car will have traveled 158,400 ft., and 152,400 ft. will be on the slab. The cars traveling in the opposite direction will be on the slab at all times and travel an equal distance. This gives a total travel on the slab of 310,000 ft. and 6,000 ft. on the shoulder, or 98.1 per cent of the travel will be on the paved road. If only 300 vehicles per day were using the road, this would be increased to 98.9 per cent. Rating the single-track road under these conditions makes it about 98 per cent a paved road as compared to a two-lane road.

Shoulder—The fourth point is the driving hazard presented by earth shoulders, particularly in wet weather. Some engineers prefer gravel or stone shoulders, although they are not a necessity for the purely farm road. The occasions when a well-maintained earth shoulder cannot be negotiated by an experienced driver are few. To the farmer used to mud roads a dirt shoulder of this kind is no road hazard, particularly if he can keep one set of wheels on the slab, and he generally can, when both drivers practice ordinary driving courtesy.

The Champaign County system previously mentioned has shoulders of typical Illinois corn belt soil, and yet there is no demand for gavel or stone shoulders, despite the fact that its neighboring county—Vermilion—does use them.

Fields of Usefulness—In studying the field for single-track concrete three conditions are presented where such roads can be used to advantage:

1. On roads on state or county systems that carry traffic of less than 500 vehicles per day now but that will obviously need widening soon when funds permit, because of traffic increases that can be definitely predicted.

2. On roads on state or county systems that will probably develop traffic densities requiring widening but the date of which is so far in the future that it cannot be definitely predicted.

3. Roads in county and township systems having present low traffic densities and upon which no appreciable increase in traffic is probable.

Each of these classifications should have different design requirements for grade line, alignment and drainage structures. Merely because a concrete slab is to be placed on a road does not necessarily imply that all the refinements of trunk-line design must be used. A single-track concrete road is not a high-type road in the accepted sense; it is an intermediate road and it should be laid on a roadbed that is no better than is used for other types of roads of its class.

* * *

II—Upkeep Cost in Illinois

By M. D. CATTON

Highway Engineer, Highways and Municipal Bureau, Portland Cement Association, Chicago, Ill.

THE HIGHWAY LAWS of Illinois provide for maintenance at state expense by state forces of all high-type pavements built by counties on the state-aid (county) system of roads. As a result several counties are building single-track concrete roads to design standards prescribed by the state highway department, and the state has been maintaining these roads for several years.

The maintenance standards on these state-aid single-track concrete roads are identical with the high standards followed on the state highway system. The paving receives regular periodic maintenance, the unpaved portion of the traveled roadway is dragged as required, and the bridges, shoulders, ditches, backslopes, guard fence, etc., receive the same attention as on the state highways.

Cost Accounting—Likewise, the same accounting system is used for maintenance expenditures on the state-aid roads as on the state highway system. All expense is charged to definite items in accordance with the accounting standards and definitions of the committee on maintenance cost accounting of the American Association of State Highway Officials. The nomenclature and standardization of maintenance cost accounting definitely provide that certain items must be charged against the wearing surface, others to shoulder maintenance, and still other items such as guard fence repair, ditch cleaning, grubbing, snow removal, etc., to a more general item termed upkeep of roadside.

This system of cost accounting makes it possible to determine where every cent of maintenance money is spent. It permits exact comparison of various items of expense

Single-track concrete road in Clackamas County, Ore.

An 8-ft. farm road in Onondaga County, N. Y.

such as weed cutting, ditch cleaning, snow removal, and others in all parts of the state. It also permits true comparisons to be made with costs of similar items in other states using the same cost-accounting system. Maintenance costs of single-track concrete roads for these items have been compiled in the accompanying tables from records of the Illinois highway department.

Road Types—The single-track concrete roads in Illinois may be placed in two general classifications: those using stone or gravel for the unpaved portion of the traveled roadway, and those using earth. In the latter case there are some maintenance costs of the untraveled earth shoulder that are included in the costs of maintaining the earth portion of the traveled roadway. By referring to the accompanying tables and the summaries of earth-shoulder maintenance on the two types of roadway it will be seen that the average earth-shoulder maintenance on the projects with metal shoulders is about $27. This sum should be subtracted from the earth shoulder and total traveled roadway costs of the projects having only earth shoulders, to determine the true cost of the earth-roadway maintenance and total traveled roadway maintenance.

Maintenance Costs—The projects included in the accompanying tables are in Champaign, Iroquois and Vermilion counties. These counties have been building single track concrete roads since 1914. Some of them have been incorporated in the state highway system, widened and their cost refunded to the county by the state, others are on the state-aid system under state maintenance. A total of 124.64 miles is included in these tables. Of this mileage 89.8 miles was constructed without metal shoulders, and 34.84 miles has stone or gravel for the unpaved portion of the traveled roadway and is identified in the cost accounting system as metal shoulders.

Maintenance costs are shown for the last three years and give a close index of average conditions. The projects were built in various years from 1917 to 1926. The oldest projects are on patrol section 51-06, Vermilion County, and were built in 1917 with metal shoulders. The slab maintenance varied from $16.74 to $22.11 per mile per year, with a three-year average of $18.94. The metal-shoulder maintenance varied from $29.27 to $160.30, with a three-year average of $92.26. The higher charge in 1930 is due to replacement of metal for the shoulders. The total traveled-way maintenance cost varied from $46.01 to $178.29, with a three-year average cost of $111.20.

The amount of traffic using these roads is a factor in the amount of maintenance needed for the unpaved por-

TABLE I—SINGLE-TRACK CONCRETE-ROAD MAINTENANCE COSTS PER MILE IN ILLINOIS PROJECTS WITH EARTH SHOULDERS

Year	Paved Roadway	Earth Roadway and Shoulders	Total for Traveled Roadway*	Upkeep of Roadside	Total Cost
Patrol section 31-65, Iroquois County, 24.81 miles. Built in 1923 and 1924. On-center location					
1928	$37.18	$48.79	$85.97	$67.72	$153.69
1929	23.69	47.01	70.70	78.60	149.30
1930	44.24	26.48	70.72	126.36	197.08
Average	$35.04	$40.76	$75.80	$90.89	$166.69
Patrol section 31-66, Iroquois County, 21.69 miles. Built in 1923 and 1924. On-center location.					
1928	$50.61	$47.70	$98.31	$119.26	$217.57
1929	42.81	68.93	111.74	90.96	202.70
1930	137.38	41.59	178.97	219.59	398.56
Average	$76.93	$52.74	$129.67	$143.27	$272.94
Patrol section 51-63, Champaign County, 14.62 miles. Built in 1924. On-center location.					
1928	$30.88	$67.79	$98.67	$139.13	$237.80
1929	16.77	71.94	88.71	169.19	257.90
1930	43.26	115.51	158.77	353.28	512.05
Average	$30.30	$85.08	$115.38	$220.54	$335.92
Patrol section 51-64, Champaign County, 23.71 miles. Built in 1924. Off-center location.					
1928	$16.63	$66.60	$83.23	$122.73	$205.96
1929	14.17	33.89	48.06	96.51	144.57
1930	31.73	94.47	126.20	129.12	255.32
Average	$20.85	$71.65	$92.50	$116.12	$208.62
Patrol section 51-81, Champaign County, 4.77 miles. Built in 1925. Off-center location.					
1928	$6.36	$32.83	$39.19	$6.08	$45.27
1929	18.33	34.84	53.17	24.45	77.62
1930	69.86	55.94	125.80	13.80	139.60
Average	$31.52	$41.20	$72.72	$14.78	$87.50
Summary of Roads with Earth Shoulders					
Champaign and Iroquois counties, 89.8 miles. Built in 1923, 1924 and 1925.					
1928	$32.25	$58.97	$91.22	$102.78	$194.60
1929	24.32	61.25	85.57	98.01	183.58
1930	64.54	70.22	134.76	180.29	315.65
Average	$40.37	$63.48	$103.85†	$127.07	$230.92

*Subtract average cost of earth-shoulder maintenance on projects having metal shoulders (roadway). Average for this tabulation is $27.28.

†Total cost, $103.85, minus maintenance cost of untraveled portion of earth shoulder, $27.28 (taken from average expenditures for this item on roads with metal shoulders), gives average maintenance cost of traveled roadway of $76.57.

TABLE II — SINGLE-TRACK CONCRETE-ROAD MAINTENANCE COSTS PER MILE IN ILLINOIS

PROJECTS WITH METAL SHOULDERS

Year	Paved Roadway	Metal Shoulders (Roadways)	Total for Traveled Roadway	Earth Shoulders	Upkeep of Roadside	Total Cost
Patrol section, 51-06, Vermilion County, 13.70 miles. Built in 1917. On-center location.						
1928.....	$22.11	$87.21	$109.32	$7.70	$101.42	$218.44
1929.....	16.74	29.27	46.01	15.42	148.76	210.19
1930.....	17.99	160.30	178.29	13.19	163.11	354.59
Average...	$18.94	$92.26	$111.20	$12.10	$137.77	$261.07
Patrol section 51-09, Vermilion County, 10.15 miles. Built in 1917 and 1920. On-center location.						
1928.....	$37.40	$64.84	$102.24	$50.38	$108.46	$261.08
1929.....	29.46	52.70	82.16	41.28	108.27	231.71
1930.....	39.16	174.06	213.22	21.15	115.50	349.87
Average...	$35.34	$97.20	$132.54	$37.60	$110.74	$280.88
Patrol section 51-22, Vermilion and Champaign countries, 6.31 miles. Built in 1921 and 1922. On- and off-center location.						
1928.....	$28.43	$153.83	$182.26	$51.32	$182.10	$415.68
1929.....	20.87	142.07	162.94	43.66	133.26	339.86
1930.....	40.47	182.30	222.77	24.22	334.06	581.05
Average...	$29.92	$159.40	$189.32	$39.73	$216.47	$445.52
Patrol section 51-62, Vermilion County, 4.68 miles. Built in 1920. On-center location.						
1928.....	$23.75	$144.35	$168.10	$8.25	$139.36	$315.71
1929.....	48.87	79.34	128.21	40.51	190.69	359.41
1930.....	46.86	74.47	121.33	48.94	1,604.10	1,774.37
Average...	$39.83	$99.39	$139.22	$32.57	$644.71	$816.50
Summary of Projects with Metal Shoulders						
Champaign and Vermilion countries, 34.84 miles. Built in 1917, 1920, 1921 and 1922.						
1928.....	$27.93	$100.44	$128.37	$28.11	$123.18	$279.66
1929.....	25.51	63.25	88.76	31.44	139.79	259.99
1930.....	32.10	156.77	188.87	22.31	373.77	584.95
Average...	$28.51	$106.81	$135.32	$27.28	$212.25	$374.85

tion of the traveled roadway. Traffic counts are not available for these various patrol sections, but many of them are estimated to carry an average of 500 or more vehicles per day.

During the football season some of the earth-shoulder single-track concrete roads in Champaign County, home of the state university, are estimated to carry a peak traffic of about 500 vehicles per hour.

The high standard of maintenance used on the state-aid roads maintained by the state is clearly shown by the expenditures given under upkeep of roadside. It will be noted that more money is spent on this part of maintenance than for the traveled roadway. The expenditures for upkeep of roadside on the metal-shoulder projects average $212.25 per mile, and on the earth-shoulder projects the average is $127.07.

At the present time the Illinois state highway laws provide that 1c. of the 3-c. gasoline tax be refunded to counties. This money may be spent by the counties on the state-aid highway system under the supervision of the state highway department. Quite often a choice of road improvement rests between a concrete surface and some of the types of gravel, stone and bituminous-treated surfaces. First cost cannot always be a determining factor. Some areas have considerable truck traffic or heavy passenger traffic and therefore require a high-type surface. Again the maintenance costs of the various surfaces must be considered. The experience of these Illinois counties shows that the single-track concrete road can be maintained in excellent condition for a minimum of cost.

A Vermilion County, Ill., single-track road built in 1916

The first concrete road in Mississippi

A 6-6½-6-in. by 9-ft. section, built in 1913 and still in service, carrying more than 1,400 vehicles per day.

A 9-ft. single-track road in Kent County, Del.

Passing on a 9-ft. road with earth shoulders.

Recent Asphalt Experiments in the Philippines

Experiments in the use of asphalt have been conducted by the bureau of public works, Philippine Islands. Six miles of asphalt were used on various sections of the road. It is planned to adopt for asphalting the public highways of the islands the material that tests show will be the most satisfactory.

Tunnel for Saddle-Horse Use on New Glacier Park Trail

Bore of 183 ft. pierces ridge to provide 3-hour saving in trail time—Horses indifferent to tunnel trip

By GEORGE W. REED
Assistant Engineer, National Park Service

Fig. 1 — Section of tunnel for saddle horses

A TUNNEL 183 ft. long for saddle horses and hikers is the unique feature that made practicable a new trail to shorten the distance from Many Glacier Hotel to Waterton Lake in Glacier National Park. With completion of the approaches this year, the improvement project will provide an easier and more interesting route for the tourist and shorten the trail time between these two points by approximately three hours. In addition, the new trail is 10 miles shorter than the old one. The tunnel is at El. 7,500 and pierces the solid rock ridge known as Ptarmigan Wall. Principal construction difficulties involved the transportation of materials and supplies for 8 miles by pack animals.

In cross-section the tunnel is 6 ft. wide and 9 ft. high and has an arched roof. The floor consists of a 3-ft. treadway for horses and mules in the center of the floor with an 18-in. rock bench 1 ft. higher on each side. This arrangement of the floor provides against the rubbing of either rider or pack against the rock sides and also permits mounting or dismounting if necessary in the tunnel without difficulty. The bore has a 3.75 per cent grade toward the north portal.

Driving was done from both portals, using jackhammers and a 120-cu.ft. compressor. Air was supplied to the north portal, which is located on a precipitous rock face, by a 1½-in. air hose over the top of the ridge, which was about 120 ft. above the tunnel grade. The rock was a fine-grained limestone and stands without support.

An interesting speculation during the progress of the work was whether horses could be induced to travel through the tunnel. Many prophesied that this was impossible, but Charles E. Randels, Glacier National Park engineer, rode a saddle horse through the tunnel shortly after completion, and the animal seemed totally indifferent to surroundings. It had also been predicted that the tunnel would prove particularly windy because of the strong winds that are customary along the northern face of the wall, but this has not been the case.

At the north portal there is an almost vertical drop of 1,000 ft. The difficulties encountered in the construction of this approach are indicated in Fig. 2. The 8-ft. trail at this point is provided with a masonry guard-rail 2 ft. high, which does not obscure the view but affords a protection for inexperienced riders. From the south portal the trail descends on a 15 per cent. grade to Ptarmigan Lake about 600 ft. below and then flattens out and continues to Many Glacier Hotel.

The new trail and tunnel project was carried out by C. E. Randels, Glacier National Park engineer, Ross Eakin, park superintendent, Frank A. Kittredge, chief engineer, and Horace M. Albright, director National Park Service. The writer was in direct charge of the work. Ole Westman & Company, of Kalispell, Mont., was contractor for driving the tunnel.

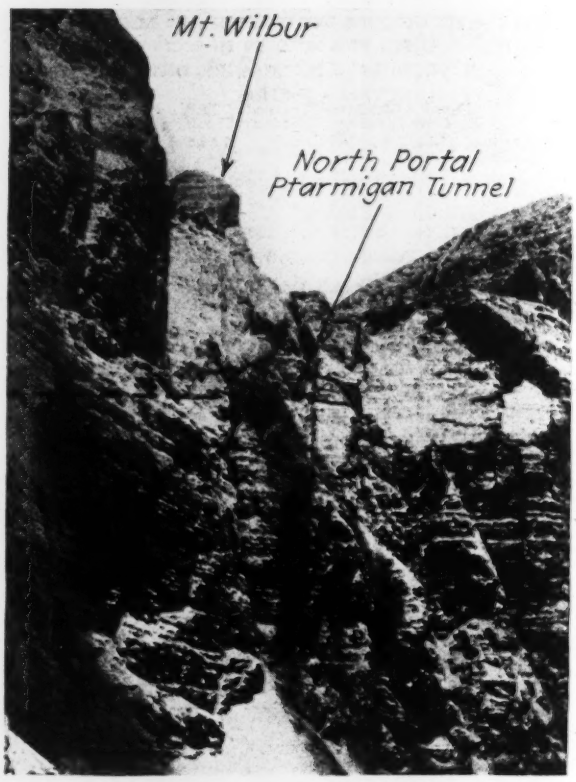


Fig. 2—Drop of 1,000 ft. at portal

The north approach trail overlooks a 1,000-ft. drop and is protected by a masonry guard-rail.

Quantity Surveys Made by Builders Association

The quantity survey bureau of the Master Builder's Association of St. Louis was organized about seven years ago as a branch of the association and controlled by it. A majority of the membership joined the bureau. Each member contributed $300, which enabled the bureau to function until some proceeds were realized from the sale of quantities. A condition of joining the bureau has always been that the applicant pay $300 in advance or agree to obtain quantities at an advanced price, the advance being credited toward the $300 fund. This fund remains the property of the members contributing, the bureau giving its note to the member for $300. This deposit is left until the resignation of the member, the dissolution of his company, or if an individual, his death. It acts as a guarantee for the payment for quantities the cost of which does not exceed the amount of the deposit. The bureau which has 30 members, is a non-profit-sharing organization and has more than paid its expenses in five out of seven years of its operation and the loss in the other two years has been trivial. The cost of the surveys has been about 0.24 per cent of the contracts awarded to the membership, or about 0.10 per cent on the volume of estimating done.

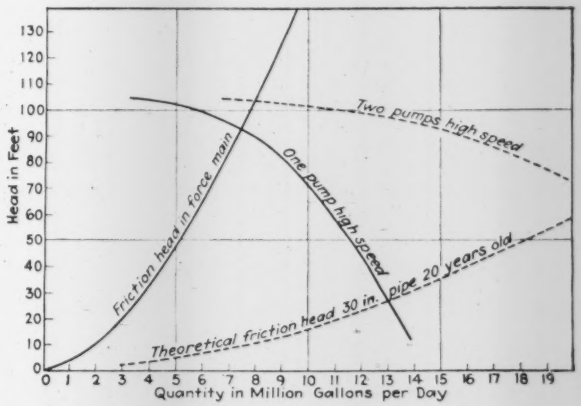
Heavy Construction Program Follows Formation of South Essex Sanitary District

Creation of modern type of regional organization enables Massachusetts towns to effect noteworthy remedial measures eliminating watercourse pollutions

By BAYARD F. SNOW
With X. Henry Goodnough, Inc., Engineers, Boston

LAMINATED deposits of industrial wastes reduced the capacity of a 30-in. outfall sewer serving the industrial cities of Salem and Peabody, Mass., in twenty years to that of an 18-in. pipe. Hydraulic losses were increased until a friction head of 100 ft. on the discharge end of the pipes was built up, although the static head never exceeded 10 ft. and was usually less than 5 ft. In consequence the use of relief gates at different points in the system became more and more necessary. The resulting pollution and adverse conditions finally forced the formation in 1925 of the South Essex Sewerage District to maintain and operate a system of sewerage and sewage disposal for Salem and Peabody as well as Beverly, Danvers and several public institutions. Costs of construction and maintenance are apportioned among the cities and institutions, one-third in proportion to valuation and two-thirds in proportion to flow of sewage. A large part of the construction is finished and the district officials are now operating the system created. Essential features of general interest involved in the project are the studies of the character, amount of treatment of the wastes, continuous cleaning of the sewers, construction of a flowing-through pumping station and an inverted siphon outfall laid on a prepared foundation by divers and experiences with split Venturi tubes for easy cleaning.

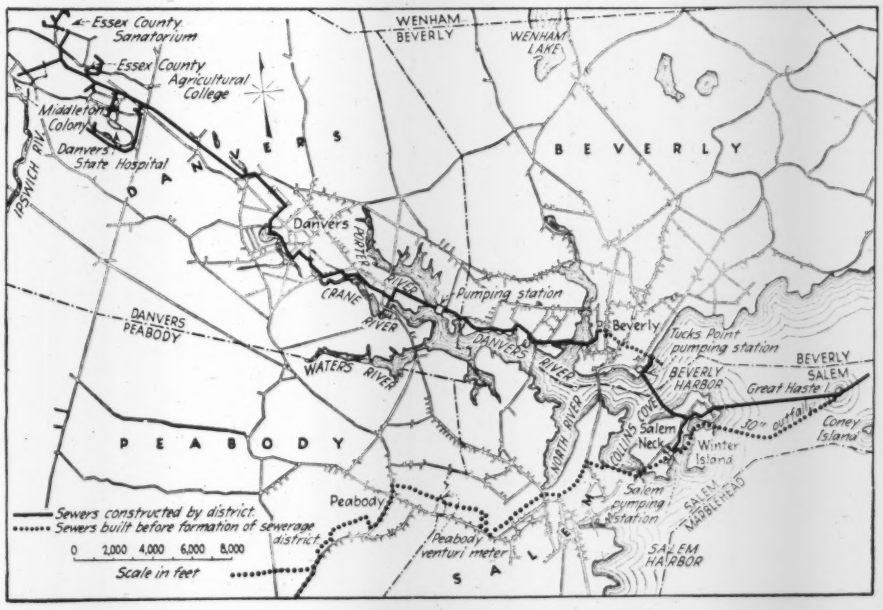
One of the principal causes for the creation of the district made it impracticable, at first, to obtain measurements of the flow of sewage that could be considered satisfactory as a basis for apportionment of costs. The


Head in Feet
Quantity in Million Gallons per Day
Friction head in force main
One pump high speed
Two pumps high speed
Theoretical friction head 30 in. pipe 20 years old

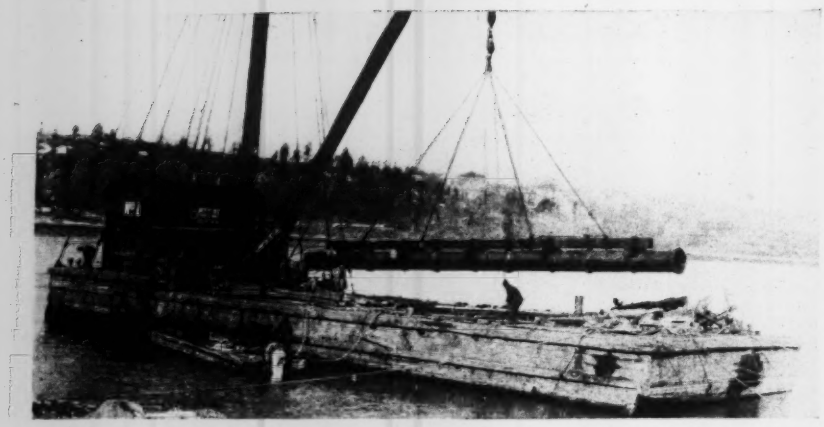
Friction head and capacity curves at Salem pumping station in 1926 before starting remedial work

sewers serving Salem and Peabody carry concentrated wastes from tanneries and associated industries, with a large percentage of caustic lime, which combines with the carbon dioxide from the organic wastes to form calcium carbonate. As a result a scale is formed much like a poorly done job of cement lining alternating with layers of fleshings, hair, grease and other organic matter. Because of the increase in friction head, the impellers of the pumps had been changed twice in the twenty years the pumps had been in service, increasing the discharge head in the effort to overcome the effect of the incrustations, until at the time the district's forces began to study the problem the friction head and capacity curves were as shown in the accompanying diagram for the Salem pumping station.

The sewage from Salem and Peabody is normally from 10,000,000 to 12,000,000 gal. daily (10 to 12 m.g.d.), with rates of 16 to 20 m.g.d. during the working hours, while under abnormal conditions the maximum rate has been estimated to exceed 40 m.g.d. It is easily seen that with a maximum possible pumping rate of 7 m.g.d. it was necessary to open relief gates daily, discharging sewage into the river and upper harbor where the organic matters settled and decomposed on the flats. Even at night, when the normal flow could otherwise have been pumped,



Territory comprising South Essex Sanitary District



Five sections of pipe joined on deck were handled by a "strongback" during the laying

Two divers guided the prepared spigot into the bell of pipe previously laid. A diver at the forward end aligned the pipe over a spike in the face of the foundation cap.

the gates were opened at low tide to lower the sewage level sufficiently to permit men to clean the deposits from the bottom and sides of the trunk sewer in an effort to increase its capacity. These deposits consisted of carbonates, grease, hair, fleshings and other matter which would have been carried along if a fair velocity could have been maintained. Because of the condition of the outfall sewer (see *Engineering News*, May 28, 1908, p. 585) and the resultant backing up of the sewage the trunk sewer necessarily became a settling basin for suspended solids, and any deposit at the lower end caused greater depth and slower velocities, with the result that the entire trunk sewer was badly clogged. The friction coefficient in Kutter's formula exceeded 0.030, which is equivalent to a decrease in the hydraulic capacity to less than half what it should be.

The conditions described resulted from the industrial wastes of only two of the member municipalities of the district, Salem and Peabody. Beverly has little industrial waste and is interested primarily in obtaining an economical disposal of her sewage at such a point that it will not pollute her shores. Danvers had no sewers but wished an outlet, as it might build a system, while the state and county institutions wished to dispose of their sewage so as to avoid possibility of polluting the water supply taken from the Ipswitch River.

Plan—Previous to the creation of the district the state department of public health had studied the needs of the municipalities and institutions and recommended the general plan that has been followed. This included the existing trunk sewer from Peabody Square to and including the Salem pumping station serving Salem and Peabody, a new outfall sewer from this station to a point in deep water in Salem Harbor, a pumping station in Beverly with a discharge main across Beverly harbor to connect with the Salem outfall and a new trunk sewer including 13 miles of lines varying from 42-in. cast-iron pipe and 30x42-in. concrete conduit down to 8- and 10-in. vitrified pipe connection to institutions from Beverly through Danvers to the state and county institutions, with a pumping station in Danvers not far from the Beverly line. More intensive study revealed little to be changed in the general scheme and designs and contracts were soon under way.

By the use of data from the office of the Corps of Engineers, U. S. Army, together with the results of the borings and soundings made by the district, a favorable location for the 30-in. force main across Beverly harbor was selected and considerable rock excavation avoided. Similarly, locations for two inverted siphons across the Porter and Bass rivers and for the main outfall sewer in Salem harbor were determined. These borings were made from a float on which there were usually three men in addition to the district's inspector. Four anchors were used to hold the float in position and locations were recorded by intersection of lines or by sextant angles to known triangulation stations along the shore. A tide staff, referred to the district's datum, enabled the elevation of any point in the boring to be determined and recorded. So-called "dry samples" at each change in solid stratification in addition to those taken at regular 5-ft. intervals were obtained.

Laying the Siphons—The 24-in. pipe across Porter River in Danvers is 620 ft. long and the 30-in. pipe across the Bass River is 800 ft. long. These two siphons, together with the 30-in. discharge main from the Beverly pumping station across Beverly harbor to Salem Neck, a distance of 2,534 ft., and the main 54-in. outfall sewer from Salem Neck, extending to a new outlet 8,810 ft. from the shore, made up practically all of the underwater work of the system. The award of all of this work under one contract permitted backfilling one section with the spoil from another and other economies, all of which helped reduce the construction cost.

The 24- and 30-in. lines were laid in sections of 60 ft., the standard cast-iron bell-and-spigot pipe being joined on the deck of the lighter and handled with the aid of a "strongback," a girder carrying inverted cradles against which the pipe sections were held during the laying. On the spigot end of the section was cast a band of lead, slightly wider and thinner than the annular space into which is was intended to fit. Two divers were able to guide the prepared spigot into the bell of the pipe previously laid, and the section was forced home into the bell as it came to rest on the prepared foundation. After being reasonably sure from outside indications that the pipe section was in its proper position, a diver-inspector would examine the field joint on the inside, measuring the opening on top, bottom and sides. Occasional minor grade changes were made by deflection at the joints, but sharper deflections were made with 11¼-deg. and 5⅝-deg. bends. Each pipe rested on two sills or pile bents, according to the foundation material, these having been carefully set to line and grade in advance.

In preparing the trench the procedure was usually as follows: For excavation the dredge would get on the line which had been previously marked every 500 ft. by what would correspond to a batter board in land work, piles having been driven each side of the trench, a timber fastened across and an upright nailed on for line. After getting on line sextant angles to known points on the shore allowed the determination of the station by referring to a previously prepared table.

A tide staff was always maintained close to the work, and by the use of a graduated dipper-stick the trench could be dug very closely to grade. In earth trench, where piles were used for supporting the pipe, excava-

tion was carried to a point 2 to 3 ft. below pipe grade. In rock trench payment was made to a grade 2 ft. below the invert of the pipe and for a width 6 ft. greater than the internal diameter of the pipe. No points of rock were permitted to project closer to the pipe than 27 in. on the sides and 15 in. on the bottom.

Pipe Bed—In the rock trench or on hard bottom, precast concrete sills, inclosing 2x6-in. spiking pieces, were bedded in gravel and set to grade, as were also the caps of the pile bents on earth foundation. Two bents or sills were placed for each 12-ft. length, and since the pipe sections on the large outfall sewer were usually 48 ft. in length, every eighth cap or sill was carefull marked with a spike for center line, using a transit from a point at the shore end of the line or from the special transit tower at the angle near the outlet. A 15-lb. plumb bob was used for transferring the line and a long pole for setting the grade at these points. By stretching a wire between the points thus determined, divers were able to set the other caps or sills to grade, using a water jet or hoe for grading the sills. Where piles were used, the correct grade was obtained by sawing the pile top or blocking up on the cap, as might be required. In general, piles were driven a trifle low and would require from 1 to 4 in. of blocking on top of the cap. Graduations on the hammer falls permitted reasonably accurate determination of elevations.

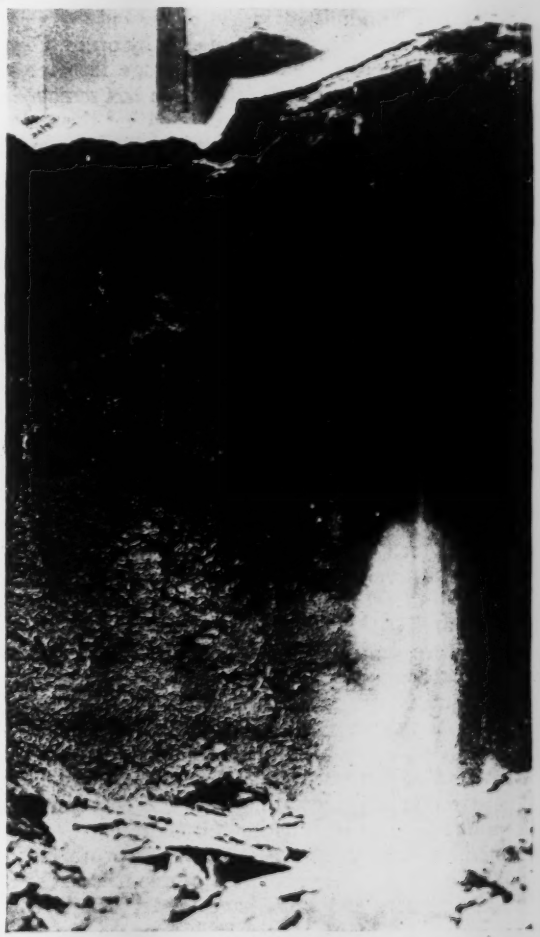
Pipe Alignment by Divers—When it came to setting the pipe section in position the diver at the forward end could feel the spike on the face of the cap and determine whether the pipe was in proper alignment, while the diver at the other end was able to guide the spigot carefully into the bell of the previously laid pipe. Wedges, cut from 8x8-in. timbers, were spiked to the caps or sills to hold the pipe in position and the cold joint was calked by the divers with pneumatic hammers. Spacing of supports was not uniformly 6 ft., but 5 ft. and 7 ft., permitting more working space at the joints and more latitude for the discrepancies that sometimes existed between the figured location and the actual results. Pipe sections were never exactly 48 ft. in length and the accumulated corrections would call for occasional adjustments to prevent bells coming inconveniently close to points of support. After the pipe was secured in place on its foundation, backfilling was done from scows that were held carefully over the pipe and allowed to discharge their loads gradually, the control being by means of the ratchet bar which operates the dump pockets.

Leakage Low—Tests of the completed line, as well as of different sections during the progress of the work, indicated a leakage well within specified limits of 0.1 gal. per day per linear foot per inch diameter of pipe with an unbalanced pressure of 5 lb. per sq.in. In conducting the final test use was made of a brick bulkhead in the precast concrete outlet, the bulkhead being removed by divers after the test was completed.

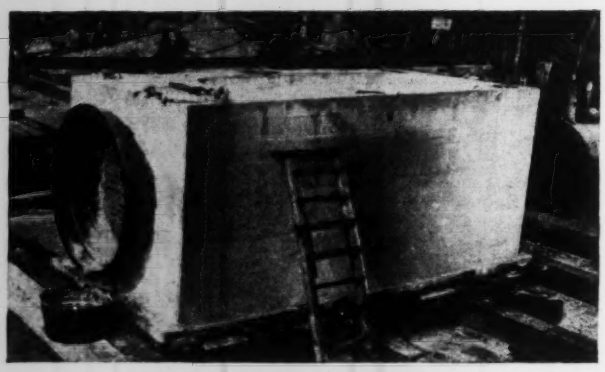
Outlet—The outlet casting as prepared at the dock in Beverly harbor was intended to conform approximately to the curve followed by a stream of sewage discharge horizontally in sea water. It was protected on its upper edge by granite blocks cut to such shapes that they would protect the concrete surface but not be likely to slip into the opening. To facilitate connection with the outlet sewer a short length of pipe was cast in the concrete with its bell in position to receive the spigot of the adjoining pipe.

Pumping Stations—There are semi-automatic pumping stations, each containing two open impeller pumps set so as to be self-priming. The slip-ring motors are located on the operating floor, which is above extreme high-water level. Automatic control equipment permits pumping between the predetermined levels and Venturi meters record the rate and amount pumped. Inclined bar screens are used at each station to intercept sticks or large objects that might completely clog the suction pipes rather than the smaller rags and waste more frequently found in the sewage. At the Beverly station, which discharges into the same outfall sewer as the old Salem pumping station, it has been found that a substantial part of the sewage can be siphoned through the pumps at low tides, thus reducing the electrical costs. The operating rooms at these stations are completely isolated from the screen well and there is no evidence of the nature of the plant except in the screen room itself, where the gases from the sewer escape through a ventilating flue in the chimney.

Trade Waste Treatment Difficult—Wastes from the tanning and associated industries of Salem and Peabody are of such a character as to make their disposal a difficult problem. The daily flow varies from 40 to 200 per cent of the normal, and under abnormal conditions the combined flow from the two cities, including a considerable stormflow that has not yet been entirely eliminated, has been found to be 400 per cent of the normal average. The large quantities of caustic lime both in solution and in suspension, in contact with CO_2 from the organic substances in the sewage, produces an impure calcium



Deposits of carbonates and organic matter in broken pipe



Outlet casting conforms to curve of discharging sewage

carbonate with a mixture of hair and fats, with the result that laminated deposits are formed in the sewer with alternate layers of calcium carbonate and organic spongy substance. These deposits have been analyzed from time to time to ascertain the source and remedies, if any, for the condition that exists. It was evident that although a considerable quantity of the suspended solids in the sewage might be removed by proper treatment at the source, the lime in solution was found to cause continued difficulty with incrustations.

Various detrimental effects of these deposits have been observed. The main trunk sewer, 3 miles in length, has throughout the years required constant attention at the hands of a sewer-cleaning gang who, because of the conditions, could be admitted to the sewer only during the period of low night flow, and then only by opening bypass gates discharging the bulk of the sewage into the river and upper harbor. A gang of five men has removed 3 to 5 cu.yd. daily of heavy sludge, eliminating the worst of the obstructions in the main sewer. However, the sewer was never clean and the general procedure was to work through the sewer from the pumping station to the upper end, taking about six months in the process. Examination of the sewer at points where the men were working sometimes showed a foot or more of heavy sludge in the bottom and deposits on the sides and roof, varying in character and thickness. The deposits of calcium carbonate were very similar to a mortar lining in the pipe and required considerable force for their removal.

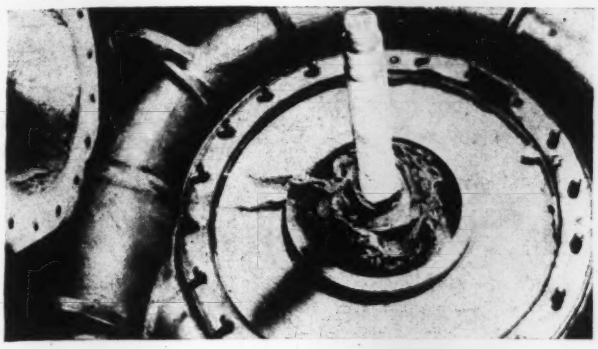
As a further obstruction to the flow of sewage, festoons of hair, grease and other organic matters were suspended from the walls and arch of the sewer. In November, 1922, careful measurements made in one section of this trunk sewer showed that in two weeks after cleaning the accumulations had caused a decrease in carrying capacity of 35 per cent. Industrial plants at a comparatively low level were often flooded out, sewage was discharged more and more frequently into the river and harbor, operating costs of pumping and cleaning were entirely unreasonable for the little that could be accomplished, and the political controversies growing out of the problem became very bitter. Construction of the new outfall sewer has resulted in a decrease in power consumption to one-third its former amount and at the same time the total sewage pumped has nearly doubled, indicating a power cost per million gallons one-fifth as high as its former rate.

Remedies—The continuance of such favorable conditions depends upon the prevention of deposits in the force main, and to this end steps have been taken to convert the caustic lime to carbonate at its source rather than allow it to be changed throughout the sewerage system. Under the supervision of H. W. Clark, who has acted as consulting chemist for the district, carbonating plants are being installed at the tanneries and other industries whose wastes are largely responsible for the condition described. These plants supply CO_2 to the wastes in sufficient amount to neutralize the caustic lime, using flue gas from the main stack of the industry, passing it through a cooler, a filter, a compressor and the necessary piping to grids installed in the settling tanks through which the sewage passes. One such plant was installed by the district as an experiment in 1928 and has proved the entire practicability of the method and at the same time has given an opportunity to study some of the details of operation. This treatment plant has recently been sold to the company operating the industry where it was located.

That such treatment is necessary is shown by the observed accumulations at accessible points on the force main and at the Venturi meters on the trunk sewer and at the pumping station. Previous records at the Salem pumping station had indicated a maximum pumping rate of 11 m.g.d., friction in the pipe preventing any substantial increase in rate by starting additional pumps. On removal of the throat section of the Venturi tube, conditions were found to be almost unbelievable. The 15-in. throat had uniform deposits of about the texture of troweled mortar, decreasing the diameter to 12¼ in. At the flange between the throat and upper end of the tube the net cross-section was irregular, with deposits varying up to 4½ in. in thickness, whereas at the upstream piezometer ring the net diameter was decreased from 30 in. down to 27 in. Using these diameters, it was estimated that the recent flow measurements had been 55 per cent too high, this estimate being confirmed by later flow measurements with a new throat section in the tube. Under conditions otherwise identical with those that obtained when former pumping rates had been recorded as 11 to 11.5 m.g.d., the new measurements gave 7 to 7.3 m.g.d.

Split Venturi Tubes—At the Salem-Peabody line two Venturi tubes had been built into the trunk sewer at an elevation below the general gradient so as always to flow full. These tubes also were much incrusted, although it was impossible to say how much the depisits amounted to. Suffice it to say that a 9-in. cleaner could not be pulled through the 12-in. throat except after repeated attempts, and that any accurate measurement of the flow was out of the question. After considerable thought had been put on the matter of ease of cleaning and ability to reach the throat section for the purpose of measuring the amount of deposits, a measurement absolutely essential for determination of the correct flow formula, a Venturi tube with a split section downstream from the throat was designed by the makers. At one end of this section a flanged joint at an angle of 60 deg. to the axis of the tube permits removal and realignment of the top half of the split section without disturbing the rest of the tube. In the writer's opinion no Venturi tube should be used for sewage measurements without this or some similar provision for thorough examination and cleaning.

Calibrated Flume—At one point in the system where measurements are necessary and where the flow is too small to be measured by a Venturi meter without danger of serious stoppages in the throat, an open flume of parabolic cross-section has been built into the sewer. The location, just above a drop manhole, prevents any tendency to back up, hence the quantity flowing is a



Lime deposited on impellers and fibrous material on shaft

function of the depth in the flume. By careful calibration of the flume with a water meter and hose stream, the relation between depth and quantity was established and a meter with flow recorder and volume meter attachments draws a clear graph of the rates of flow and gives on a dial the total amount between consecutive readings. The mechanism is actuated by a 12-in. float in a cast-iron float well connected to the flume by 1-in. piping with suitable traps for catching sediment.

In the main the construction program recommended by the state department of public health has been followed and the results have been as expected. Detailed study of the district's needs have resulted in relatively few modifications in size, grade or location of the trunk sewer, but the results from the chemical surveys have shown the desirability of treatment of industrial wastes not originally included in the program, thus adding materially to the supervision necessary. One important part of the system, the inadequacy of which was noted in the report of 1923 leading to the creation of the district, is the Salem pumping station. The condition of the equipment at this station, together with the lack of a suitable suction well, has been the principal reason for the deposits in the trunk sewer, deposits that have cost the cities large sums, both directly and indirectly. The use of the new outfall sewer from this station has eliminated part of the former trouble by permitting cheaper and generally complete disposal of the sewage where previously only about one-half the total quantity could be pumped, but the deposits in the trunk sewer will continue to form until such time as a reasonable velocity in the trunk sewer can be maintained, which cannot be done with the present facilities.

The entire project as constructed has cost $1,863,000, of which $154,000 has been for interest on temporary notes and $50,000 for a section of existing sewer acquired by the district.

The board controlling the district consists of the city engineers of Salem and Peabody, commissioner of public works of Beverly, county engineer of Sussex County, chief engineer of the state department of health, a representative of the town of Danvers and a chairman appointed by the governor with the advice and consent of the council. Karl R. Kennison, the first chief engineer, organized an engineering force of from twelve to twenty men and carried on the design and construction for a year, since which time the work has been carried on by the writer as resident engineer, with Frederick D. Smith as consulting engineer. Seth Peterson acted as assistant engineer in charge of construction during the active period of construction.

Welded Siphons on New Orleans Drainage System

Electrically welded 14-ft. steel siphons, largest ever built, form direct and cross-connections of high- and low-level canals—Large screw pumps

FOUR welded steel siphons, 14 ft. and 10 ft in diameter, the two former said to be the largest ever built, are conspicuous parts of the Lennox pumping station recently completed for the sewerage and water board of New Orleans. Two 14-ft. welded steel siphons on the high-level canal system have each a capacity of 1,000 sec.-ft. at 8-in. head. A 10-ft. siphon 140 ft. long connects the low-level canal systems across the high-level canal, and a similar but shorter siphon connects the low level with the high-level system. Both of the smaller siphons have a capacity of 500 sec.-ft. at 8-in. head. In all there are 200 tons of $\frac{3}{8}$-in. boiler plate, with 23,950 ft. of electric welding on the siphons.

In Fig. 2 the two 14-ft. siphons of the high-level canal are at the left, while the long 10-ft. siphon extends across the high-level canal to connect the two low-level canals. The shorter 10-ft. siphon, behind the far end of the longer one, connects the low-level and high-level canals. Low concrete walls keep the high-level water within bounds, while the large siphons take it over the levee protection wall. The pipes shown connect the siphons with the vacuum pumps in the station. In Fig. 3 the suction pipes of the two screw pumps are at the left, and the two 14-ft. siphons at the right, with the long 10-ft. siphon beyond the latter.

This pumping station, the latest addition to the extensive stormwater drainage system of New Orleans, is on the south side of the river and is intended to drain a saucer-shaped area of about 11,500 acres, including the Algiers district of the city. It is situated at the head of the Algiers outfall canal, which extends 5½ miles to the Hero pumping station at Little Barataria Bay, where the water is again pumped, being delivered to channels discharging into the Gulf of Mexico. In the district served the annual rainfall is 60 in., with a high precipitation rate of 5 in. per hour and slow runoff, except for a high rate of high-level runoff from a densely populated section of 1,970 acres. High-level collecting canals serve 7,180 acres between El. 24 and El. 32; low-level canals serve 4,320 acres between El. 24 and El. 19.

Foundation conditions for the building offered a dif-

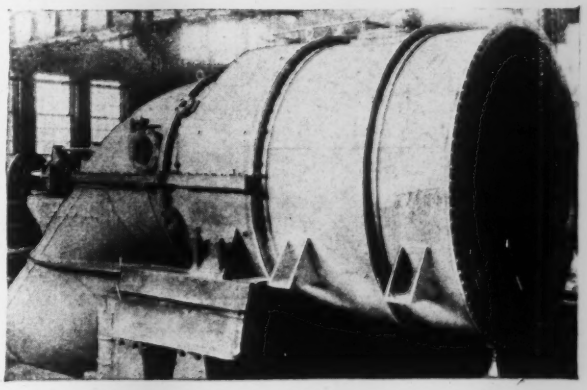


Fig. 1—Screw pump, 110-in. diameter, set up in shop

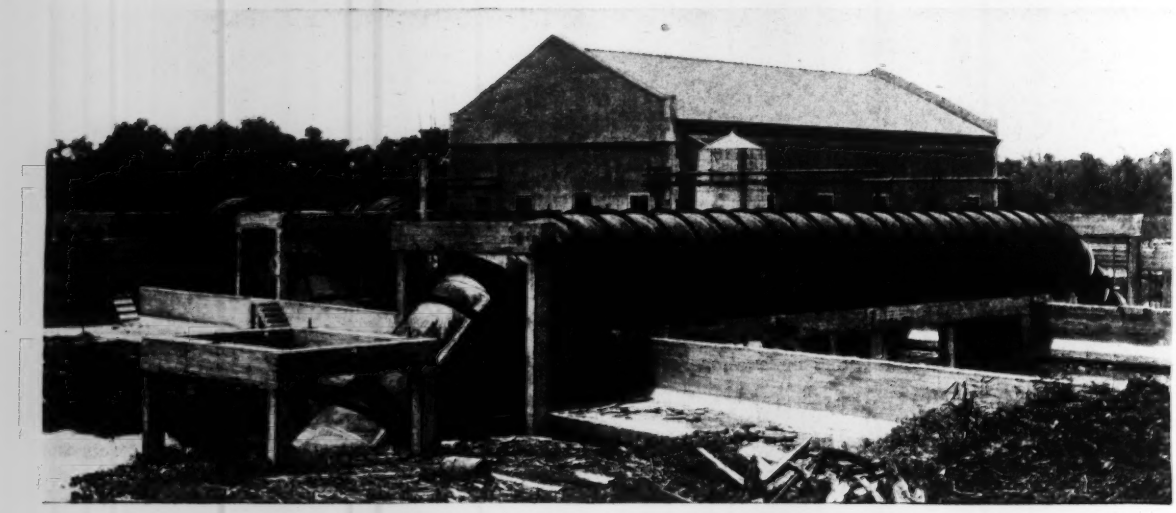


Fig. 2—Welded steel siphons at New Orleans

High-level 14-ft. siphons at left. Long 10-ft. siphon connects low-level canals across high-level canal.

ficult problem, the site being humus and mud to an indefinite depth. Reinforced-concrete foundation walls and four exterior walls supporting the siphons and separating the high- and low-level basins were built over cofferdams composed of two rows of 25-ft. concrete sheetpiling held apart by struts, the space between them (11 to 13 ft. wide) being filled with mud. Within these spaces were driven the precast concrete bearing piles, 16 in. square and 55 ft. long, loaded to about 30,000 lb. per pile and depending entirely upon skin friction for support.

Two screw pumps, 110 in. in diameter, of the Wood type and designed by the engineers of the board, handle the low-level canal drainage. Each pump (Fig. 1 has a capacity of 400 sec.-ft. against a 7-ft. head, and is driven by a synchronous, three-phase, 25-cycle motor of 425 hp. There is also a constant-duty centrifugal pump of 120-sec.-ft. capacity against a 7-ft. head, driven by a similar motor of 300 hp. An efficiency of more than 75 per cent has been developed by the screw pumps. Current at 6,600 kw. is supplied from the board's city power station, 5 miles of underground cable being laid and embedded in concrete 12x12 in.

For emergency supply the Algiers station C has an alternator of 825 kw. driven by a diesel engine. Air is exhausted from the pumps and siphons by two vacuum pumps, one of which is coupled to a gasoline engine for emergency service. The siphons and pumps can be air-locked in case of excessively high level of water on the discharge side.

Advantages obtained by the use of siphons include less cost (including foundations) than bypass gates, perfect cutoff, elimination of leakage and avoidance of complicated gate-operating mechanism, while the operation is controlled entirely from within the building. This type of construction also requires a minimum of excavation and gives an extremely low cost of building and foundations, especially in the soft ground encountered.

This pumping station, with its equipment, was designed under the direction of A. B. Wood, mechanical engineer of the sewerage and water board, and Bryson Vallas, general superintendent. Wade Barnett was designing engineer, and Louis T. Frantz electrical engineer. The pumps ($27,000) were built by the Fulton Iron Works Co., St. Louis, Mo.; siphons ($45,000) by the C. C. Elmer Tank & Boiler Works, New Orleans, La.; building ($215,000) by Thomas H. Brockman, New Orleans. Incidentals at $153,000, including diesel engine and alternator, brought the total cost to $440,000.

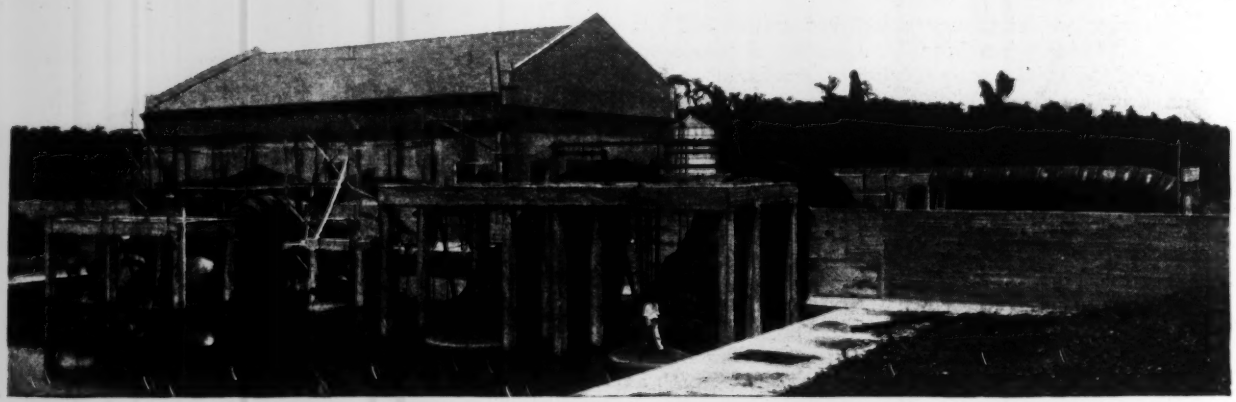


Fig. 3—Lennox pumping station and siphons, New Orleans

Pump suctions at left, 14-ft. siphons at right, with 10-ft. siphon in rear

Structural Steel Men Consider Quota Plan

Conferences at A.I.S.C. convention result in proposal for production cartel—Internal improvement of industry discussed in progressive spirit—Technical session deals with steel floors, house construction, wind tests and welding

IN THE MIDDLE of the most active convention in its history the American Institute of Steel Construction, industrial association of the bridge and structural shops, was surprised in its sessions last week at White Sulphur Springs, W. Va., by the announcement that a production quota plan had been evolved in a series of conferences of leading independents during the two days preceding. The plan in full was laid before the meeting, and after discussion it was endorsed in principle and was referred to the board of directors for study of its legality and practicability, with a view to putting it into effect.

Even aside from this sensational development, internal improvement of the industry was the chief subject of the convention. "The exigencies of the times," as one speaker called them, gave quite a special tone to the meeting. Production is low (2 million tons in 1931 against a peak year of 3½ million and an estimated capacity of 4 million or more), prices are still lower, competition is described as keen and sometimes cut-throat. The results — unsound practices and reduction of profits to the vanishing point—were discussed both on the floor and in group conferences.

The industry was fully represented, though the attendance was smaller than in other years. Leading subjects included trade practice rules, a sales policy, market expansion through new uses, a standard form of contract, segregation of steel contracts, mill relations and local associations of fabricators. Only one technical session was held.

A.I.S.C. Quota Plan

Principle—Each member of the industry is entitled to his proper share of the business available.

Organization—A local association in each fabricating district of the country, coordinated by the Institute as central agent.

Production Data — Bookings to be reported monthly, and all members informed of the percentage of bookings to capacity, both for the individual districts and for the country as a whole.

Quota Basis—The rated capacity of each member is to be determined annually; its ratio to the country's total capacity will form the member's quota share for the year. Total sales during the year multiplied by this percentage determine the member's quota allocation for that year.

Extra Dues for Excess—A member exceeding his allocation is to pay extra dues to the Institute, $2 per ton up to 5 per cent excess, $3 per ton for additional excess up to 10 per cent, and so on.

Guaranteed Fund—Each member deposits with the Institute 25c. per ton of his rated capacity, to cover his obligations with respect to extra dues.

The Production Quota Plan

The quota plan, developed in conferences headed by Howard A. Fitch, president Kansas City Structural Steel Co., Kansas City, Kan., was reported to the convention by C. G. Conley, president Mount Vernon Bridge Co., Mount Vernon, Ohio. "The principle on which the plan is based," Mr. Conley said, "is that every member of the Institute is entitled to his proper share of the business available." Each member is assigned a certain quota percentage each year, and is penalized for exceeding his quota by paying extra dues to the central agency (the Institute).

Despite increase in total production of structural steel, profits have declined until the industry is in a very struggle for existence. "Over-capacity is the difficulty," said Mr. Conley, yet some fabricators forget that "they owe it to their buying public to have available at least a 25 per cent reserve capacity to take care of emergencies. It is the futile striving to keep this 25 per cent occupied that ruins prices on the 75 per cent."

Production Districts—The plan contemplates a series of local associations, each representing one of the logical districts or trade areas into which the country is divided, all working in harmony with the Institute. The latter would coordinate the local work, establish trade practices and handle public relations, while the local associations would deal with internal problems of the district.

Bookings to Be Reported — Monthly bookings are to be reported, and operating percentages computed for each district and for the entire country from the ratio of bookings to capacity. Publication of these figures would tend to stabilize bidding and employment, it is expected.

Quota Assignment — Each year the annual capacity of each member is to be determined. Apparently this figure is to be based not only on shop capacity but also on business done in the preceding year or years. The member's percentage of the country's total capacity will determine his quota share of the country's total structural business.

Extra Dues for Excess Over Quota—The total business reported at the close of the year will show whether the member exceeded his quota. For such excess he is to pay extra dues to the Institute, $2 for every ton of excess up to 5 per cent, $3 per ton for the second 5 per cent, $4 for the third, and so on. The Institute may audit his books to verify the report.

Deposit—Each member is to keep on deposit with the Institute 25c. per ton of his rated capacity as a guarantee fund to cover any quota-excess payments that may accrue against him. Interest on the deposit is credited to him, and any balance of the deposit is to be refunded to him when he withdraws. He may withdraw at the end of any year on two months' notice.

Strong favorable views on the principle of the plan were expressed in discussion. The most important thought was contributed by W. M. Wood, president Mississippi Valley Structural Steel Co., Decatur, Ill., who suggested that the plan might best be worked out so that the payments to the Institute would constitute an unemployment fund, similar to that contemplated in the Swope plan. R. B. Thomas, of the Structural Steel Board of Trade, New York, and others endorsed this suggestion, remarking that a plan aimed at restraint is questionable, but one directed toward stabilization of employment can be justified.

Criticisms or questions related mainly to details, such as basis of quota allocation, definition and overlap of districts. The exchange of views made it clear that the capacity determination will have to consider many factors. Some of the leading questions and objections were covered by Mr. Conley as follows:

The plan does not control prices, as any fabricator is left free to take any job at any price (subject to the quota excess). Nor does it discount good management or place a premium on inefficiency, for an efficient plant can pay the quota-excess charge and yet beat the inefficient one, and in time the inefficient plant's quota will drop to zero. For the same reason the efficient plant is free to grow; it may pay an excess charge one year, but it will have a larger quota the next year. This can only be done on the sound basis of superior efficiency, however, for otherwise the price paid for the quota increase is so large as to discourage the process. Undue expansion of plant, therefore, is checked.

Related Business Problems

Several papers closely related to these questions of industry cooperation or to unsound competition were given careful attention by the meeting, though generally without floor discussion.

Industry Organization—Howard A. Fitch opened a keynote paper with the assertion "The industry is in dire distress," and said that unemployment is bearing heavily on its workers. He reviewed the history of cooperation attempts among fabricators during the past twenty years and pointed out that these have not made competition healthy and prices fair because of the absence of good selling standards. He urged that all competitive facts relating to a job be developed before bidding, and that each bidder consider his natural territory and class of work. Cooperation should be effected primarily through local groups. Production can be regulated by each fabricator knowing his minimum and filling it at moderate prices, but charging higher prices on orders beyond this amount. "An idle fabricator is as much of a menace to the industry as a smallpox patient is to a community," he concluded. Thomas J. Foster, National Bridge Works, New York, also stressed the need for better selling: "Steel is produced by highly perfected machinery to bring its cost down to the lowest point, but then is sold by a guessing contest," he remarked. He called for a planned industry, with rules for enforcement.

Many of the points advocated by Mr. Fitch were included in a code of sales policies presented by R. D. Wood, of the Mississippi Valley Structural Steel Co.

Karl E. Vogel, Omaha Steel Works, Omaha, discussed in thorough detail the functions and value of local associations, taking the Central Fabricators Association as chief example. A. S. Miller, Jr., Eastern Bridge and Structural Co., Worcester, Mass., supported the argument by the case of New England, where the local association has succeeded in putting the Institute's code of standard practice into effect.

Trade Practice Code—The Institute's code of trade practice, adopted two years ago but extensively changed by the federal trade commission early this year, was condemned as useless by R. T. Brooks, president George A. Just Co., New York. "The federal trade commission as at present constituted, cannot act as a stabilizer of industry. Its ideas and dictums change as the wind bloweth," he said. He suggested amending the federal laws to allow an industry to control overproduction and provide for the continued welfare of permanent employees by entering into agreement with some designated government agency for a fixed period as to permissible cooperative activities.

Standard Contracts—In 1907 a standard form of structural-steel contract was drafted by George Lund, John Hamilton and Robert C. Post for use in the New York field. With occasional revisions it continued in use, and in 1927 it was adopted by the Structural Steel Board of Trade, New York, with the result that 60 per cent of building contracts there use this form. Mr. Post in an instructive paper analyzed the clauses of this contract and showed their importance to sound practice in selling steelwork. Contract forms used by general contractors and architects usually contain clauses that are unfair to the steel contractor.

Separate Steel Contracts—H. B. Hirsh, president Belmont Iron Works, Philadelphia, and L. D. Rights, Shoemaker Bridge Co., New York, discussed relations to the general contractor. Mr. Hirsh argued for segregating steel contracts from the general contract. Mr. Rights, though he described various difficulties in dealing with general contractors, did not hold the segregated-contract system to be a full remedy. He laid more emphasis on one-price bidding, through which "we might come to the stage where we would be willing to post our bids on the courthouse door." E. W. Krueger, president Worden-Allen Co., Milwaukee, said that attempts are being made in Wisconsin to establish the New Jersey system of segregating steel contracts. J. B. Shryock, chief engineer, Belmont Iron Works, also supported the separate contract and claimed that many major structures could be completed a month earlier if the steel were let direct.

Statistical Data—Clyde MacCornack, general manager Phoenix Bridge Co., Phoenixville, Pa., pointed out the lack of statistics on structural steel. The industry does not even know its total investment or number of workers. On the other hand, weekly reports of steel lettings published by the census bureau are misleading because too frequent, and they should be discontinued. He suggested statistical work by the Institute.

The convention passed a resolution favoring modification of the anti-trust laws to permit "agreements in industry to limit overproduction in any line of endeavor," on the ground that the present financial difficulties of industry are due in part to legal restriction on industrial cooperation.

Technical Work

The single session devoted to technology was active and brought forward valuable information. A new steel floor, the Belmont interlocking floor, was described and load tests reported; the results of the first series of fire tests on "battledeck" steel floors were presented; the wind-pressure test installation on the Empire State Building was described; welding was discussed; further

possibilities in steel-house construction were outlined.

Large New Markets Foreseen—An estimate of future expansion of structural-steel markets through new applications was contained in the report of L. H. Miller, chief engineer of the Institute. After stating that in two years nearly 250,000 tons of steel have gone into battledeck floors in bridges and buildings, he placed the ultimate market possibilities of steel floors at 4,000,000 tons per year. Steel guard-rails for roads might go beyond a million tons. Massachusetts has installed some and estimates an annual use of 30,000 tons in that state. The United States market might reach 1½ million tons per year. Steel houses and farm buildings, steel piling, dams, curb edging and automobile-parking facilities were envisioned by Mr. Miller as other large possibilities. Fred T. Llewellyn, United States Steel Corp., New York, added to these forecasts by suggesting that a market of 4 million tons per year may be found in replacing machinery castings by rolled steel welded up in structural shops.

Three elaborate researches in steel structures are being carried on or supported by the Institute: wind-pressure and sway tests on the American Insurance Union Building in Columbus, in cooperation with Prof. C. T. Morris of Ohio State University; similar but more extensive tests on the Empire State Building in New York; and fire-resistance tests of bare and protected battledeck floors at the Bureau of Standards in Washington. No results were reported from Columbus or New York, but the Empire State test arrangement was outlined. It will be presented in a future issue.

The fire tests of battledeck floors comprise three groups: fire on top of the floor, fire below the floor, and fire and water below the floor. The first group is completed, but the others will not be completed until next August. The tests with fire on top of the floor showed that comparatively light surface protection, such as 2 in. of concrete, is adequate to maintain the structure against severe and long-continued fire exposure from the top. Detailed data will be given in a future issue.

* * * *

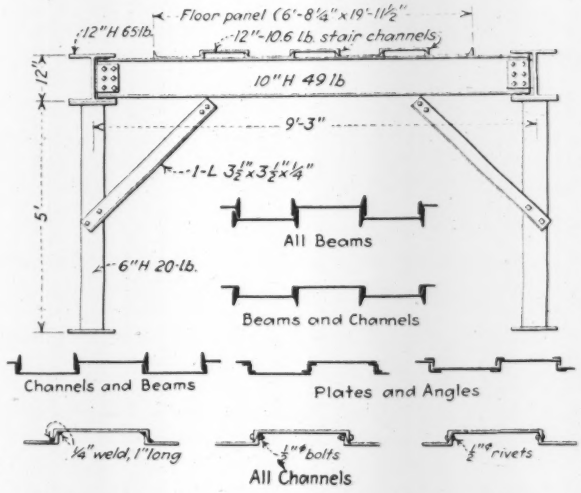
Three Papers on Improved Steel Construction

Floor of Interlocking Steel Shapes

By JOSEPH G. SHRYOCK
Chief Engineer, Belmont Iron Works, Philadelphia, Pa.

[—Abstract of a paper read before the American Institute of Steel Construction.]

THE BELMONT rolled structural-steel interlocking floor is assembled from standard sections—usually rolled channels, but if necessary I-beams or even built-up plates and angels—by laying the sections flat and fastening them together at the flanges, as shown in the accompanying illustration. Bolts, rivets or welding may be used. It is contemplated that the alternate troughs formed by such an assemblage of structural shapes will be utilized for wire conduits and pipe to be buried in a floor fill. A fireproof ceiling may be hung from the beams that support the floor panels. The floor is also suitable for use as a bridge deck. Some of the advantages claimed for this type of floor are that: (1) it can be fabricated and erected by the structural-steel contractor; (2) it provides a firm platform for the steel erectors and the general contractor and building trades; (3) it squares all floor panels, through the girder connections, for the steel erectors; (4) it is flexible in design, being adjustable both in length and width; (5) it provides strength and stiffness with minimum deflection; (6) it provides horizontal stiffness for distributing wind; (7) it permits savings in columns and foundations by virtue of its light dead-weight per square foot; (8) it can be shop-fabricated in sections of any number of units; (9) it permits the beams supporting the floor to be spaced four to six times farther than with a plate floor; (10) it can be detailed by the fabricator along with the primary steel frame; and (11) it eliminates all floor forms of wood or other material.



Belmont interlocking steel floor test set-up, showing also low floor may be formed by various assemblies of structural shapes

During the first week of October a series of load tests was run at the Eddystone plant of the Belmont Iron Works on three floor panels 7 ft. wide by 20 ft. long, set on three two-column bents; and utilizing riveted, bolted and welded connections respectively. The floor for these tests was made of standard 12-in., 10.6-lb. stair channels.

Five types of loading were utilized, as follows: (1) uniform loading, 40 to 60 lb. live, plus 65 lb. dead, producing a maximum deflection of $\frac{7}{32}$ in.; (2) uniform loading, 120 lb. live, plus 65 dead, producing a maximum deflection of $\frac{7}{16}$ in.; (3) uniform loading, 200 lb. live, plus 65 dead, producing a maximum deflection of $\frac{31}{32}$ in.; (4) combination of (1) and (3), or 380 lb. per sq.ft. total, producing a maximum deflection of 1⅛ in.; and (5) a concentrated load of 8,000 lb. on 1 sq.ft. near center of 10-ft. panel, producing a maximum deflection of $2\frac{9}{16}$ in. Deflections were read at 4.215 ft. in from either end of the 20-ft. panel. In general, the bolted floor showed the greatest deflection and the welded the least. A supplementary welded test was made, comparing deflections when the floor was attached to the end supports and when it was loose. About $\frac{1}{32}$ in. more deflection

was found with the panel loose. The extensometer readings were not wholly consistent, but a stress of about 35,000 lb. per sq.in. was indicated on the bottom of the floor when subjected to the heaviest uniform load. All three panels were in excellent shape after the tests and showed no sign of incipient failure in any of the rivets, bolts or welds.

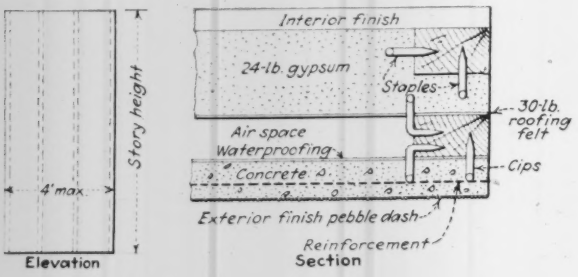
* * *

Improved Steel-House Construction

By THOMAS J. FOSTER
Chairman, National Bridge Works, New York

[—Abstract of a paper read before the American Institute of Steel Construction.]

IN THE EFFORT to improve house construction by using the elements of fireproof city buildings the author proposes to combine with a steel frame a series of fabricated or partly fabricated units and to use modern erection methods. These elements can be applied to any plan or architectural effect, and, according to careful estimate, will result in a house costing less than ordinary frame construction.



Wall construction of Foster house

The steel frame offers no difficulty. For a small house of popular type, costing normally about $6,500 for the building alone, the columns would be 4x4x¼-in. angles, the first-floor girders 6-in. 12½-lb. I-beams, and the filling beams 5-in. channels.

Outside walls would be built of slabs, made in the shop and including both exterior and interior finish as shown in the above illustration, fastened to the steel frame in the field. This form of wall insulates better than ordinary walls and will not shrink, harbor vermin, or burn. The same type of slab with exterior and interior finish would be used for the roof. Partitions are thin slabs of aerated gypsum with a finished surface on both sides.

Floors are cinder-concrete slabs poured in permanent forms laid on the floor beams and insulated from the sound-carrying steel. It is convenient for electric wiring to be installed in the slab before the concrete is poured. Any type of floor surface may be applied to the slab. This construction saves in the height of the building. Every riser eliminated from the stairs saves daily exertion.

Relative costs of a brick-veneer house versus my type of construction are shown in the accompanying table.

COMPARATIVE HOUSE COSTS (ROUGH WORK ONLY)

	Ordinary	Foster
Wall		
Brick veneer on wood frame, sheathing, plastering, 2,225 sq.ft.	$1,835	
Steel in walls, fabricated slabs, 2,000 sq.ft.	.....	$1,200
Roof		
Prepared roofing, 15-lb. felt, sheathing, frame, and plastering, 980 sq.ft.	441	.....
Steel roof, fabricated slabs, 850 sq.ft.	.....	595
Partitions		
Wood studs, plastering, 1,360 sq.ft.	428	.....
Fabricated slabs, 1,520 sq.ft.	.....	486
Ceilings, 90 sq.ft.	.....	45
Floors		
Wood joists, rough floors, no sound deadening, plaster ceiling, 1,380 sq.ft.	400	.....
Steelwork, floor and ceiling, 1,380 sq.ft.	.....	566
	$3,104	$2,892

* * *

Welding Performance Data

By P. J. HORGAN
General Electric Co., Schenectady

[—Abstract of a paper read before the American Institute of Steel Construction.]

THE AUTHOR is conversant with one case in our factory where, today, three men are turning out the same amount of welding work done three years ago by eight men. It was then, and still is, a hand-welding job.

Formerly half of a man's time was spent in handling his work alone, moving it about to the correct working positions. We improved the facilities for getting the work to and from the welder, and then established the maximum current commensurate with the desired quality; we were able to cut costs in half without imposing extra hardship on the workman.

In the well-organized welding shop 1 kw.-hr. of energy is required to deposit 1 lb. of weld metal. This theoretical balance between power and weld metal should be multiplied by a factor of 0.75 to compensate for various losses and allow for obtaining the desired appearance in the weld.

The average current used to produce a ⅜-in. fillet weld is 200 amp. for horizontal welding and 175 amp. for vertical, with approximately a 20-volt arc in either case. This represents 4 kw-hr. of energy, or 4 lb. of weld metal, reduced to about 3 lb. per kw.-hr. for practical purposes.

Data on structural-steel buildings welded in the field show a net average deposit of 50 in. of ⅜-in. fillet weld per per man per hour. We find that in the shop a man can weld a ⅜-in. fillet at the rate of 2¼-in. per minute, or 135 in. of weld an hour. It is evident that the difference between these two figures represents time in which the workman in the field is doing something other than welding.

A turbo-generator stator frame as made in the factory is somewhat similar to the framework of a building. A case in point may be cited of a frame 7 ft. long, 7 ft. 3 in. high, and 8 ft. 5 in. wide, weighing 6,700 lb., with 7,000 in. of welding, of which about 6,000 in. is ¼-in. fillet. The time allowance on the entire job is 110 hours. Average welding per man totals 64 in. per hour, indicating that two-thirds of the workman's time is spent getting the work ready for welding. There is a total of 432 in. of ⅜-in. fillet weld, attaching bars that must be accurately located. The time allowance for this welding is 38 hours, or a welding rate of 11½ in. per hour. This shows that when a man has to spread his welding from place to place, to minimize distortion and get accurate dimensions, checking virtually every move he makes, the greater part of his time is spent assembling and inspecting rather than welding.

On production work we have data on work where 200 in. of $\frac{5}{16}$-in. fillet weld, starting an arc 100 times,

is regarded as basis for one hour's work, using 3 lb. of $\frac{3}{16}$-in. electrode. In another case 100 in. of $\frac{3}{8}$-in. fillet weld plus 1,000 in. of $\frac{1}{4}$-in. fillet weld constitutes an hour's work, starting an arc 48 times, and using $4\frac{1}{2}$ lb. of $\frac{1}{4}$-in. electrode.

There is no general basis for welding costs. It is better to assume that quality welding at lower cost can be obtained only by using maximum currents permissible without undue distortion of the structure. The cost problem then reduces itself into an engineering analysis involving supervisory control of the procedure of welding and handling of the elements that go to make up the completed structure.

LETTERS TO THE EDITOR

High Shearing Resistance of Concrete for Earthquake Bracing

Sir—In the article by Norman Green, "Concrete Walls for Earthquake Bracing of Tall Buildings," published in your Sept. 3 issue, attention is called to the use of reinforced-concrete walls for resisting the shearing force set up by earthquakes. Reference is made to the article by the writer (*ENR*, March 27, 1919, p. 430) on the results of tests made for the Emergency Fleet Corporation.

Mr. Green has given representative values of the shearing strengths and has indicated that they apply to beams with a low length-depth ratio. On the other hand, he has used the gross shearing strengths given in the table accompanying the article referred to. The final report of the tests, which formed the basis for the brief *ENR* article, has been published as Technologic Paper 314 of the Bureau of Standards (1926), and in this report the total (gross) shear has been divided into the portion carried by the web and that carried by the frame. For rectangular beams the lower (corrected) value should be used.

Mr. Green implies also that the length-depth ratio has an important effect on the shearing strength. The investigation reported by the writer did not show experimentally that the length-depth ratio is unimportant, since it was impractical to get enough reinforcement (both tension and compression) into a beam of long span to prevent bending failure at loads causing much less shear than those named. However, the information on this subject is summed up in the following paragraph (Technologic Paper 314, p. 484):

> The data on the effect of depth of beam on web stresses and web resistance were not extensive, and other variables than depth of beam were involved, so that the results are not conclusive. Except for beam 4BE21, which was rectangular in cross section, the equation $v = (0.005 + r)f_v$, which was derived from the data of the beams 36 and 52 in. deep, seems to apply fairly well to the data of the beams which were 18 in. deep.

It is not because beam 4BE21 was rectangular that an exception is made of it, as is indicated by the following quotation (page 437):

> The fact that the points for the rectangular beams (having 12-in. webs) fall well above the average for all the points tends to confirm the reasoning which indicates that the data of Figs. 38 and 39 apply to rectangular beams.

The writer would not hesitate to design a deep girder for an ultimate load which would cause shearing stresses equal to one-half the compressive strength of the concrete if vertical stirrups are used, or more if inclined reinforcement is used. Such a girder would probably be short in proportion to its depth and probably would be an I-section. This is not because of any limitation of the high shearing strength to cases with low length-depth ratios or to I-sections, but because with such high shearing stresses it would be impossible to get sufficient longitudinal reinforcement into such a girder to resist the longitudinal stresses if the length-depth ratio is large and if the flanges are not made wider than the web thickness.

In an earthquake the shearing forces may be in any direction. The adaptability of a reinforced-concrete girder to such a case is well brought out in the loading of a beam (*ENR*, Nov. 14, 1918, p. 903, and Technologic Paper 314, Fig. 24) to a shearing stress of 727 lb. per sq.in. forty times in succession, after which the beam was inverted and tested to failure at an ultimate shearing stress of 1,550 lb. per sq.in.

W. A. SLATER
Director, Fritz Engineering Laboratory, Lehigh University

Bethlehem, Pa., Sept. 17, 1931.

Before publication of the above letter was possible, Prof. Slater's untimely death occurred. Arthur R. Lord, co-author with Prof. Slater of Technologic Paper 314, writes that the letter, "meets with my entire aproval, and should be published even though its author has unfortunately passed away before its publication was possible. Having been associated with Prof Slater in the planning, supervision and execution of these tests and in the authorship of the paper referred to above, I shall be glad to stand sponsor for this discussion should any further exchange of information or views become necessary."—EDITOR.

Wood Trim in Public Buildings

Sir—In an editorial in your issue of Oct. 1 entitled "One Opportunity" you quote from the National Fire Protection Association *Quarterly* a paragraph that gives "immense quantities of wood trim and equipment" as part of the hazardous construction of state capitol buildings. The editorial suggests that employment might be found for the unemployed this winter in tearing out this wood trim and equipment as well as other wood installations. In effect, of course, this puts *Engineering News-Record* in the position of opposing wood trim in capitol buildings and, by logical inference, in other monumental buildings.

We have an idea that you would not of your own initiative have recommended the elimination of wood trim in public buildings—no matter what your position might be about other uses of wood in such buildings—and that the position taken in this editorial is due to the inadvertent acceptance of the whole of the premise of the Fire Protection *Quarterly*. You are doubtless aware that in recent years there has been a great revival of the vogue of wood trim and finish, including paneling, in office buildings, hotels, banks, stores, city halls, federal buildings, etc., where every consideration of fire risk was given due weight.

The lumber industry would be the last to favor the use of wood for a purpose that would result in a recognized fire hazard in such buildings. Its obvious interest in the long-time preservation of markets is to avoid any untoward happening that would tend to discredit its use as a building material.

We do not think that architects and building proprietors should be advised to dispense with the decorative use of wood in large buildings. We could support this opinion by a long line of facts and extended argument, but in the interest of brevity we would call your attention to the report of the special committee on fireproof wood, made to the New York multiple dwelling law committee in December, 1930. Without attempting to summarize the committee's views of "fireproof" wood, we shall rest our case merely on what it said about unprocessed wood. This report showed that according to official figures only 1.6 per cent of the fires in tenements in Manhattan, the Bronx and Richmond for the five years 1925-29, that were not confined to their original source, were spread by means of wood flooring, doors, trim and windows. "This, however, includes fireproof and non-fireproof construction and fires in wood beams and roof construction, not really interior wood finish."

THEO. M. KNAPPEN,
Director of Information, National Lumber Manufacturers Association

Washington, D. C., Oct. 14, 1931.

NEWS OF THE WEEK

Prevailing-Wage Law Is Unconstitutional, Says Arizona Court

THE Arizona law demanding that "contractors must pay the current per diem rate of wage" on public works within the state has been declared unconstitutional by unanimous decision of the State supreme court. The decision follows the precedent of the U. S. supreme court on the Oklahoma law.

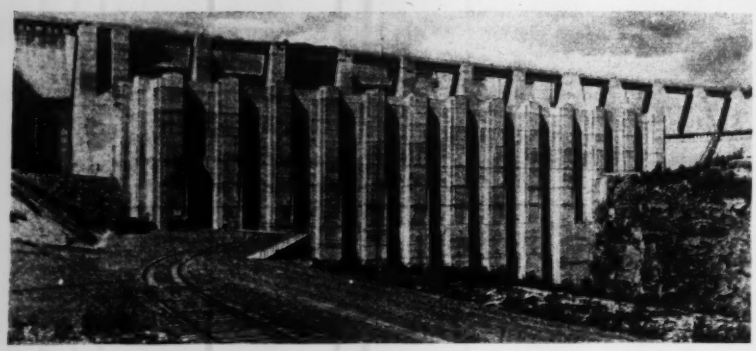
The original trial showed that wages actually ranged from $6 to $10 a day. This, the Arizona court declares, compares with the Oklahoma case, in which the per diem wage ranged from $3 to $4.05 a day, a range that fails to inform the employer as to which wage he should pay to satisfy the law. In the opinion handed down by the Arizona court it is granted that the state or any of its political divisions may establish a minimum rate of wages for labor on public works and similarly it may establish a current rate if it so desires, but if the wording and content of the law are such that the contractor is unable to determine between two or more alternative wage rates, the law is unconstitutional. For, says the opinion, in such case the court might conclude that the alternative adopted by the employer was the wrong one and so seek to deprive the contractor-employer of his property without due process of law.

57th St. Bridge Plans Amended

Revised plans for the construction of a suspension bridge across the Hudson River at 57th St., New York City, have been filed with the war department by the North River Bridge Co., of which Gustav Lindenthal is president and chief engineer. Permission is sought to build a span with a vertical clearance of 200 ft. at the center and 185 ft. at the pierhead lines. The department has already indicated (*ENR*, April 2, 1931, p. 576) that such clearances are the minimum which it would consider adequate for a bridge that might be built at this point.

Storm Sewer in Salt Lake City to Be Built by Hand Labor

By a vote of two to one the taxpayers of Salt Lake City on Oct. 27 authorized a $600,000 bond issue for a storm sewer. The project involves construction of a system of storm and drainage sewers to protect lower areas of the city against flooding and will provide employment for about 5,000 men, the work to be rotated. Local labor only will be employed, to be obtained through the local municipal employment bureau. Hand labor will be used on all units except a part of the excavation on the main system. It is estimated that the additional cost of hand labor over machine operations will be about $35,000.



UNUSUAL DESIGN USED FOR CHUTE-A-CARON POWER HOUSE

An appearance of massiveness has been obtained in the recently completed power house of the Chute-a-Caron plant on the Saguenay River in Quebec at little increase in the cost of the structure. The power house is located in a deep rock cut directly in front of the dam at the westerly side of the river. During construction the river was diverted through the channel which now forms the tailrace from the power house. The power house contains four units of 65,000-hp. capacity each under a normal head of 150 ft. Ultimately the Alcoa Power Co., owner of the project, purposes to build a diversion channel from the pool back of the Chute-a-Caron dam across to the Shipshaw River valley, a tributary of the Saguenay River, to develop a total head of 205 ft. The capacity of the Shipshaw plant will be about 1,000,000 hp., and when it is completed the Chute-a-Caron plant will be used for the development of secondary power. A complete description of the project was given in Engineering News-Record, Dec. 5, 1929, p. 889.

Brown to Oppose Louisiana Plan for River Flood Control

By PAUL WOOTON
Washington Correspondent

WHEN hearings begin in December before the flood-control committee of the House Major Gen. Lytle Brown, Chief of Engineers, is expected to oppose the flood plan of the Board of State Engineers for Louisiana on the ground that it involves an expenditure not justified by the present state of development of the Tensas and Atchafalaya basins. He will also oppose the Louisiana plan because it provides for reservoirs on the Arkansas River, which he regards as impracticable.

After careful investigation Gen. Brown is convinced that it would be more difficult and more expensive to secure the lands needed for the reservoirs than would be needed for the broad floodway provided in the Jadwin plan. Moreover, he is not convinced that the reservoir plan would obviate the need for a floodway through the Boeuf and Tensas basins.

Against Further Payment of Damages

Gen. Brown already has gone on record as opposed to further payment of damages or further purchases of land. He is expected to reiterate and re-emphasize the need for carrying out that policy at the forthcoming hearings. He contends that the authorization of $325,000,000 is not adequate for the work, and that if payments are to be made for land and damages an increase in the amount authorized must be obtained, which, he points out, is likely to be difficult at present.

Gen. Brown also will voice the objections of the army engineers to the plan submitted by J. P. Kemper, who proposes to charge the increased cost to navigation. Gen. Brown thinks that a navigation channel through the Boeuf, Tensas and Atchafalaya basins would not attract a great amount of commerce. It would be tantamount to paralleling an existing line of railway which is in a position to handle all of the traffic likely to develop for an indefinite future period. More than that, navigation tends toward New Orleans. It would be difficult to build up another port on the lower Atchafalaya. He is in full agreement with the principle of Mr. Kemper's plan, which provides a second adequate channel through which excess water may be diverted from the Mississippi River.

While Gen. Brown is hopeful as to the possibilities of increasing the discharge capacity of the main channel

between the Arkansas River and the Red River, he points out that the feasibility of that plan cannot be established without lengthy studies. If its feasibility should be demonstrated it would require years, in all probability, to secure the additional funds for work that may cost as much as the Panama Canal.

Since the days of Humphreys and Abbott, Gen. Brown points out, most of those who have studied the river have concluded that there must be diversion from the main channel at or near the mouth of the Arkansas River if the lands below are to be insured against overflow. That conclusion was reached when the maximum flood was estimated at one-half the volume that now is known to be possible. For that reason he leans strongly to the diversion, but he believes a fixed barrier will serve the purpose much better than a fuse-plug type of levee. If a flood should barely top a fuse plug, the whole levee would go out. If a concrete weir is installed, there would be exceptional occasions when some water would flow over it, but he believes that the small amount of water likely to leave the river under those conditions could be handled much more easily and could be drained off much more quickly than the extended flow that would follow a crevasse in the fuse plug. In his concrete weir Gen. Brown proposes to install a movable central portion, fitted with needles, like the weir at Bonnet Carré, through which water would be allowed to flow in controlled amounts at all times.

Gen. Brown is much interested in the effort of the interests in the Atchafalaya basin to agree among themselves on the best plan for protection in that part of the valley. The people in that area are left in a particularly dangerous situation by the deadlock that has arisen; they are on the ground and have the advice of competent engineers. The army engineers have no pride of opinion and will be willing to alter their plans if a feasible alternative is presented.

Unemployment Conditions Considered by National Association of Manufacturers

COMMUNITY and industrial methods of relieving and preventing unemployment were considered at a conference held under the auspices of the National Association of Manufacturers at New York City on Oct. 29. Speakers at the meeting included both public and industrial officials. In general, the former confined themselves to describing relief measures taken last winter and proposed for the coming winter, while the latter devoted their attention to employment insurance, stabilization of industry, the spreading of labor over a larger number of men through reduction in hours, and similar topics.

Municipal Relief

Work relief programs in three cities which handled this problem with unusual success during the past winter were described, respectively, by Francis T. Maloney, mayor of Meriden, Conn.; George M. Welsh, city manager of Grand Rapids, Mich.; and Francis E. B. McCann, secretary of the Mayor's Emergency Unemployment Relief Committee of Wilmington, Del. In all three of these cities the principle adopted was that a fair return should be received for the money expended, and relief work was distributed in the form of jobs on municipal projects. Meriden, with a population of 40,000, was fortunate enough to be bonded to less than half of its legal limit; the major part of the relief burden was therefore carried by a bond issue supplemented by city appropriations and public contributions. Water main and sewer extensions were completed to serve every section of the city at prices considerably cheaper than under normal conditions. The scrip-payment system used at Grand Rapids was described in *ENR*, Oct. 15, 1931, p. 612. At Wilmington the steps taken were similar, but emphasis was placed on work of a non-competitive nature to avoid affecting wage scales in the city. Many jobs were provided by a campaign to stimulate the repair and remodeling of private dwellings.

Industrial Efforts

Industrial leaders at the meeting were concerned more with long-range plans for averting future depressions than with the present emergency, although several of these are now in operation. J. W. Hook, president of the Geometric Tool Co., New Haven, and chairman of the employment relations committee, New England Council, and the Connecticut Commission on Unemployment, pointed out that there are no great difficulties in planning industrial stabilization, but that the major difficulty lies in securing adoption of any single plan. He also listed fourteen definite recommendations adopted by the New England Council as the result of an extensive inquiry among industrial executives, indicating the composite opinion of these men as to the most effective way of combating the present situation and forestalling its recurrence. Spreading employment over the maximum number of persons through reduction in hours was the primary recommendation. Others included the improvement of employee morale; clean-up, repair and modernization campaigns; the planning and budgeting of profits, sales and production; cooperation with community relief plans; and the exchange of information among communities on employment opportunities.

Nineteen industries in Rochester, N. Y., have subscribed to a plan of operation designed primarily to reduce the peaks and hollows in employment demand, according to M. B. Folsom, assistant treasurer of the Eastman Kodak Co. Each company sets aside 2 per cent of its annual payroll for five years, thus creating a fund available for unemployment benefits. As the plan cannot function until after several years of accumulation, it is having small effect in the present emergency. Permanent employees only are eligible for benefits, to be paid when their weekly earnings are below 60 per cent of normal. One of the important features of the plan is that it stimulates industrial planning to avoid the necessity for laying off men, thus tending to decrease distress due to unemployment.

A somewhat similar system now in effect at works of the General Electric Co. was described by W. W. Trench, secretary of that organization. This differs from the Rochester plan in that the employees contribute 1 per cent of their normal wages to the fund, matched dollar for dollar by the company. Contributions cease when pay drops below normal. As an emergency measure, the amount paid into the fund by the men has recently been increased to 2 per cent from all those drawing more than half their normal pay. Administration is in the hands of a board with equal representation from workmen and company executives.

Other stabilization plans depending primarily on reduction of hours with the retention of the normal working force were described by James L. Donnelly, executive vice-president of the Illinois Manufacturers Association, and F. A. Miller, president of the H. C. Godman Co., Columbus, Ohio.

Probably the most interesting proposal made at the session came from William Ganson Rose, Cleveland, who presented a plan devised by L. F. Chadwick, president of the Perfection Stove Co. This is based primarily upon the premise that if work now available, estimated at 70 per cent of normal, were spread over the total number dependent upon industry for a living, all of these persons would have sufficient for the necessities of life and no relief would be necessary. Mr. Rose proposed the establishment of a standard working week for each industry, the number of hours to be set by a commission appointed for this purpose and to be varied as fluctuations in business may make this necessary. Employers refusing to adhere to the standard would be penalized by law. Thus an industry with a normal working week of 44 hours would, in times of stress, reduce this to 40, 36 or even 32 hours but would still provide a living for all workmen normally employed.

Nutley, N. J., Rejects Town Manager Plan

In a referendum on Oct. 27 the town of Nutley, N. J., rejected the manager form of government by a vote of 3,861 to 2,650. The town is now governed by a commission.

Owens River Aqueduct Again Dynamited

Two sections totaling 15 ft. in length of the Grapevine canyon siphon of the Owens River aqueduct of the Los Angeles, Calif., department of water and power water-supply system were destroyed by dynamiting early Nov. 2. Belief was expressed that the dynamiting was an act of vandals rather than a renewal of the former bitter controversy that prevailed between the city and ranchers of the Owens and Antelope valleys over the city's purchase of water rights. The aqueduct was dynamited nine times from 1924 to 1927, during the city's negotiations for water rights.

H. A. Van Norman, chief engineer, said that repairs will require about four days. Water in storage in reservoirs near the city is ample to supply the demand while repairs are being made, he said.

Western State Engineers Discuss Water Problems

Discussion of broad policies affecting control and development of the water resources in the public-land states formed a major part of the program at the fourth annual conference of the Association of Western State Engineers held in Sacramento, Calif., Oct. 28-30. Representatives from twelve of the seventeen Western states that comprise the organization were present in addition to delegates from six federal departments. George M. Bacon, state engineer, Utah, was elected president for the coming year.

Among the resolutions adopted at the close of the sessions were: a suggestion that Weather Bureau activity could be improved in so far as it applied to engineering work; a request that the Bureau of Reclamation present at the next annual meeting an outline of its attitude toward the acquisition, adjudication and control of unappropriated water supplies; an indorsement of the principle of federal relief for drainage and irrigation districts as set forth in the Smith bill; a request that Congress give serious consideration to the report which the committee on conservation and administration of the public domain, appointed by President Hoover, rendered to the President.

The results of overlapping authority between state and federal agencies on phases of water development were discussed at length following the opening paper outlining the history of the conflicts in jurisdiction by S. T. Harding, consulting engineer, Berkeley, Calif. The subject was presented by a state engineer and a representative of a federal department.

Following a review of the California state water plan, M. C. Hinderlider, state engineer, Colorado, presented a paper on the penalties which result from lack of forethought in planning water development.

G. W. Malone, state engineer, Nevada, a member of President Hoover's committee on the administration of the public domain, reported on the work of the committee and the conclusions reached. Discussion did not bring out any statements to indicate the attitude to be expected by individual states on this question.

Employment Plans in the West

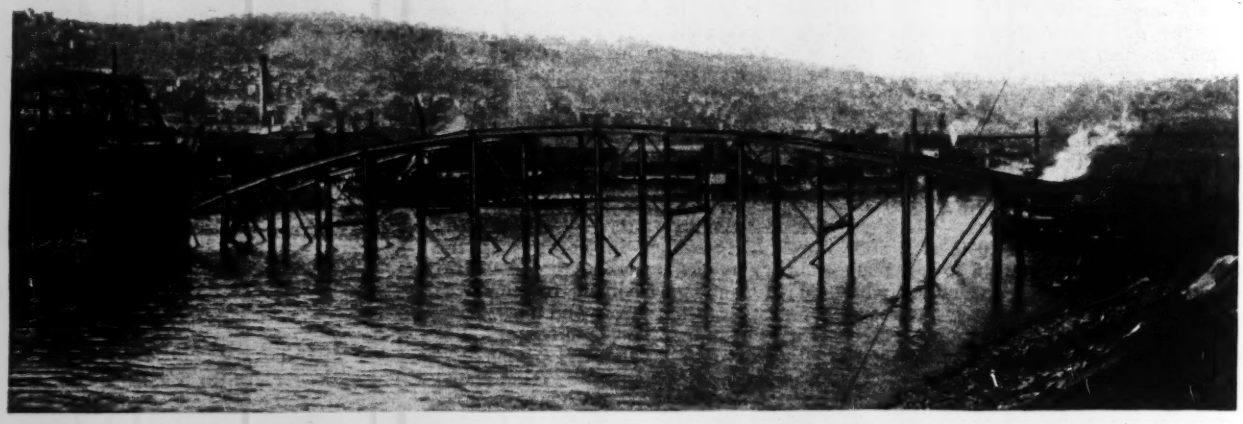
The Western states are making every effort to carry out the national plan of unemployment relief. Practically every community feels that it can take care of its own citizens, but is confronted with the problem of the transient. It has been estimated that 6,000 arrive weekly in California on freight trains from the Middle West and East. One of the plans suggested to meet this emergency in northern California is the organization of state camps below the snow line in the Sierra Nevada Mountains where the men may have a place to live and be fed. In return the men would be required to do the work of the camp, cut wood and fire trails in the forest and do road work where possible.

It is estimated that 26,000 men are employed directly or indirectly by the California state department of public works. During the past ten months $36,685,089 has been devoted to highways, including $21,395,281 for construction, $5,887,245 for maintenance and $9,402,563 covering going contracts carried over from 1930.

San Diego is proposing a $300,000 bond issue for unemployment relief. While steps are being taken to determine whether or not there will be an election on the bond issue, the city council has appropriated $20,000 for immediate relief. Oakland has started the registration of all unemployed throughout the city. A volunteer organization is planned to canvass all factories, offices and homes for possible work to be done. The East Bay Municipal Utility District, Oakland, will employ 225 men as laborers on a four-day week schedule this winter instead of 150 men on a six-day schedule, to aid in relieving unemployment. The amount of money expended by the district will be the same.

Construction by the Pacific Telephone & Telegraph Co. of a $2,500,000 central office building in San Francisco has been announced. The building was scheduled for erection in 1933. Through advanced construction and spreading of work under reduced time schedules, the company has been able to keep about 1,450 employees a month on the payroll during the past year who would otherwise have been discharged.

Seattle has announced plans for providing city relief work for 4,100 residents who have registered for emergency employment. Rotated work will be provided on the basis of need. According to the present registration, the program will require $450,000 for the winter. This employment relief will be clearly defined and kept separate from the regular work of the city and will in no way alter the prevailing city wage scale.



DEMOLISHING OLD TENTH STREET BRIDGE AT PITTSBURGH

The old Tenth St. bridge at Pittsburgh is being demolished to make way for a new suspension span. The main span, shown in the water, was removed from the piers by jacks. On Oct. 19 the side span was dropped into the river by dynamiting the tops of the piers. It is expected that the new bridge will be placed in service the latter part of 1932.

Stevens Declares Nicaraguan Canal Unwarranted

At a joint meeting in Baltimore on Oct. 22 of the Maryland Section, Am.Soc.C.E., the Engineers Club of Baltimore and the affiliated national engineering societies, John F. Stevens, chief engineer of the Panama Canal during the early stages of its development, spoke on "The Canal Situation." He made it very clear that in his opinion building of a Nicaraguan canal is entirely unwarranted, that it would add a great tax burden to the people of the United States and that it would provide another vulnerable point to be guarded in the event of war. He said that the Panama Canal is adequate for all uses until 1960 and that if a third series of locks is built it will in all probability have sufficient capacity for the next hundred years.

Salt Lake City Wage Dispute Goes to Secretary of Labor

Disputes over prevailing wage between workers in Salt Lake City and the Orndorff Construction Co., general contractor for the federal building addition and veterans' bureau hospital now being constructed in that city, have been referred to the secretary of labor for decision. According to Thomas P. Hyland, investigator for the department of labor, the Orndorff company is paying below the prevailing scale.

Lax Supervision Scored by Grand Jury in Indictment

The October Grand Jury of Erie County, N. Y., on Oct. 30 returned indictments against William J. Beardsley, Emil Cerullo, treasurer of Liberto & Cerullo, contractors who built the $800,000 Wende infirmary, and the firm of Liberto & Cerullo. They are accused of first degree attempted grand larceny and of presenting a false voucher to collect county money. Beardsley is the architect who supervised construction. The grand jury investigation grew out of a report by a special committee of architects that the county had been defrauded of $25,000 when actual construction was compared with original plans and specifications.

The grand jury stated that it found county supervisors lax in their methods of letting contracts and in failing to have a contract with Beardsley. Parts of the grand jury's report follow:

"We recommend that future contracts shall be let on a unit basis—that is, unit costs be submitted for each item of the work. The total sum of these items is to be used only to determine the low bidder on the job.

"Supervisors appointed to the building committee should be compelled to visit the scene of operations at least weekly and take actual measurements of the work in progress, and should familiarize themselves with the plans and specifications to aid them in an intelligent inspection. Under no circumstances should there be deviations from plans and specifications unless ordered by the supervising architect with the written approval of the building committee, subject to the approval of the board of supervisors. In selecting men to serve on such building committee only men with experience in building construction should be made members so far as is possible."

Hoover Dam Notes

Excavation and grading for the Six Companies' railroad to serve the Hoover Dam project were completed during the week ended Oct. 24. Laying of rails and ballasting of track neared completion. Steady progress is being made on the Black Canyon highway.

During the week no work was done on canyon wall stripping above intakes on the Arizona side. Work was resumed in the large heading being driven from the lower portal of the outer Arizona tunnel. This heading has now advanced 319 ft. Enlarging of pioneer headings to headings 38 ft. high was commenced on both inner tunnels, advancing 164 ft. on the Arizona side and 74 ft. on the Nevada side. Driving was continued in pioneer headings in all four tunnels.

During the week 11,250 cu.yd. of material was handled for the grading of streets of Boulder City. Excavation has been started on the filtration plant. A total of 5,055 ft. of sewer lines has been laid.

The total number employed during the week under review was 2,700. Completion of the Six Companies' railroad has released a large number of men who, it is expected, will be reemployed by the various new features of the project which are about ready to begin. Registration at the employment agency indicates that there is a large excess of men available for work on the project.

Major Gen. William L. Seibert, D. W. Mead, Robert Ridgway, W. J. Mead and Charles F. Berkey, of the Colorado River Board, spent three days inspecting work at the dam site. Chief Engineer R. F. Walter also inspected the work.

Annual Meeting, California Section, A.W.W.A.

At the twelfth annual convention of the California Section, American Water Works Association, Oct. 28-31, at Stockton, Calif., 29 papers were presented, including three arranged by the recently formed water-purification division, whose first meeting was an outstanding feature of the convention. The registration was about 400, with representatives from points as far away as British Columbia and Arizona. An amendment to the bylaws included Arizona in the territory of the section.

Officers elected for the coming year are: president, W. F. Goble, manager, San Gabriel Valley Water Co., Alhambra; vice-president, Ray F. Goudey, department of water and power, Los Angeles; secretary-treasurer, R. F. Brown, California Water Service Corp., Stockton. Coronado was selected as the city in which to hold the annual convention next October.

First Examinations for Engineers Held in California

Under the California law providing for the registration and licensing of engineers, the first examination to be held since the law was passed was held in Los Angeles Oct. 22, 23 and 24 and in San Francisco, Oct. 29, 30 and 31. The law provides that applicants not having technical training must take a three-day examination; those having technical training a one-day examination. In Los Angeles seven applicants took the one-day and four the three-day examination. In San Francisco ten applicants took the one-day examination and five the three-day.

Hydro-Electric Treaty Not to Prejudice New York's Rights

Any rights that the State of New York may have in the hydro-electric development of the international rapids section of the St. Lawrence will not be prejudiced by negotiation of the treaty with Canada for construction of the seaway. This was the gist of Secretary of State Stimson's comment following a conference Oct. 28 with representatives of the New York State Power Authority.

The state officials conceded that the authority of the federal government is paramount with respect to navigation but insisted that, as the project also involves power, the disposition and use of the share belonging to this country must be agreed between the federal and state governments before negotiation of the treaty with Canada proceeds any further. The Power Authority submitted the following as the fundamental principle that should govern the relations between the federal government and the state:

"In international matters affecting the joint rights and interests of the United States government and one or more of its sovereign states and their sole and separate rights and vested interests, respectively, an understanding should be reached between the federal and state governments as a condition precedent to entering upon negotiations with a foreign nation."

The federal government, said Secretary Stimson, can undertake the two-stage development for improving navigation on the river. The state can go into the courts with its claim to any power that the dams may create, but it cannot block the project, he said. Charles P. Craig, executive director of the Great Lakes-St. Lawrence Tidewater Association, commented that the disposition of the power belonging to

each country is a purely domestic question that predictably will not be dealt with in negotiating the treaty. The proportional division as between the two countries of water for power purposes, has he says, already been settled by the boundary waters treaty of 1909.

This might close an issue that had no political implications, but it is plainly evident from the attitude of the state officials that they will not permit these to be overlooked. As an exponent of states' rights, Gov. Roosevelt could enlist wide support in the South for his position and probably could provoke enough opposition in the Senate to block ratification of the treaty.

Los Angeles Drops Ninety-Six Technical Employees

The city council of Los Angeles, Calif., has approved the plans of J. J. Jessup, city engineer, and the board of public works to drop 96 technical employes from the city engineering department, effective Nov. 30, to meet retrenchment requirements. In addition, 79 unfilled positions in the department will be eliminated. Removal of the 96 employes will save the department $152,000 for the present year.

Prominent Equipment Maker Found Killed

Philip A. Koehring, president of the National Equipment Corp., Milwaukee, Wis., was found shot to death on Oct. 31, near Manston, Wis. His body was found in his automobile in a field into which his car had swerved. Authorities are investigating the case on the assumption that Mr. Koehring was murdered. The local coroner stated that the location of the bullet wound made it extremely unlikely that death had been caused by suicide.

Mr. Koehring's death removes an outstanding leader of the construction industry. He was born on a farm near Kiel, Wis., in 1876. Early in his business career, which he began in the position of accountant, he visualized the future of concrete as a construction material and in association with his brother, W. J. Koehring, and Richard Kiel, organized the Koehring Machine Co., in 1907, to manufacture mixers and other construction equipment. This company grew and prospered under Mr. Koehring's leadership. In 1928 he foresaw that the construction industry could best be served if much of the unrestrained competition among equipment manufacturers could be eliminated. The result was the National Equipment Corp., a consolidation of numerous existing manufacturing and distributing facilities.

Mr. Koehring was active in cooperative movements among manufacturers, as reflected by his activities in the Mixer Manufacturers' Bureau and the Shovel and Crane Manufacturers' Association. Conservative and truthful in advertising, he was an exponent of fair trade practices.

In addition to his company and business interests he was past-president of the Milwaukee Association of Commerce and at the time of his death a member of its board of directors.

Massachusetts Opens Highway and Bridge Construction Bids

Bids on highways and bridges totaling $1,500,000 were submitted to the Massachusetts state department of public works at Boston on Oct. 27. Three of the contracts amounted to about $350,000 each, but the only one awarded was for the construction of 28,882 ft. of highway in the Sharon-Walpole-Norwood section to Carlo Bianchi & Co., Inc., on the lowest of 21 bids, $359,550.

E. D. Ward & Co., of Worcester, were lowest bidders to construct 15,991 ft. of highway in Worcester and Shrewsbury on the Boston-Worcester turnpike. Their offer was $380,999, but the contract was withheld.

The McClintic-Marshall Corp., of Bethlehem, Pa., was the lowest of four bidders for the contract to construct a steel bridge in Erving and Gill. The low bid was $256,910.

Welch & Moyniham, of Salem, Mass., received the contract for highway construction in Newburyport and Newbury. The winning bid was $22,845.

SOCIETY CALENDAR

AMERICAN ROAD BUILDERS' ASSOCIATION, Washington, D. C.; annual convention and road show, Detroit, Mich., Jan. 9-15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting Jan. 19-22, New York City.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Chicago; annual meeting, St. Louis, Jan. 26-29.

INTERNATIONAL ACETYLENE ASSOCIATION, New York City; annual meeting, Chicago, Nov. 11-13.

NATIONAL PAVING BRICK MANUFACTURERS' ASSOCIATION, Washington; annual meeting, Chicago, Feb. 10-12.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual meeting, Pittsburgh, Jan. 27-29.

ENGINEERS CLUB of San Francisco held its annual meeting and election on Oct. 28. The following officers were elected: president, Stanley Sharp, Standard Oil Co. of California; first vice-president, W. R. Birt, assistant superintendent of telegraph, Southern Pacific Co.; second vice-president, H. D. Dewell, consulting engineer; secretary, R. A. Hudson, of Hunter & Hudson, consulting engineers; treasurer, A. D. Oliver, vice-president, Wells Fargo Bank.

MASSACHUSETTS ENGINEERS ASSOCIATION held its fall dinner at Boston on Oct. 26 and was addressed by Morgan T. Ryan, state registrar of motor vehicles, who made a plea for safe driving and observance of the rules of the road. Representative Horace T. Cahill spoke on legislation affecting civil engineers.

WISCONSIN SECTION, American Water Works Association, attracted to its annual convention at Racine, Oct. 26 and 27, more than 150 waterworks men. Administrative problems and water-purification practice, construction, operation and maintenance of waterworks plants were discussed. Officers elected for the ensuing year are: chairman, H. H. Brown, Milwaukee; vice-chairman, H. P. Bohmann. The next meeting will be at Appleton.

Personal Notes

RAYMOND C. BRIANT has been appointed to the fellowship recently founded at Mellon Institute of Industrial Research, Pittsburgh, Pa., by the Green Bag Cement Co., of Pittsburgh. Mr. Briant for several years has been engaged in research under the auspices of the Portland Cement Association at the U. S. Bureau of Standards. His work at Mellon Institute will be concerned with studies of the chemical and physical properties of portland cement.

R. K. ROCHESTER, general manager of the Eastern Region, Pennsylvania Railroad, has been appointed assistant to the vice-president in charge of operation, with headquarters at Philadelphia. He succeeds Walter S. Franklin, who resigned to take the presidency of the Wabash Railroad. Mr. Rochester has been in active service on the Pennsylvania Railroad for more than 30 years. He began work as an assistant on an engineering corps.

LOUVA G. LENERT has been named chief sanitary engineer for the Florida state board of health. Mr. Lenert began his public health work as assistant sanitary engineer for the Texas board of health and later was sanitary engineer with the International Health Board, assistant sanitary engineer for the U. S. Public Health Service and sanitary engineer for the California state board of health.

E. L. CRUGAR, construction engineer of the Illinois Central R.R., has been appointed chief engineer of the Wabash R.R., with office at St. Louis, Mo. This position had been vacant for the past few years.

HAROLD T. LIVINGSTON, engineer of construction for the Chicago, Rock Island & Pacific Ry., has been appointed division engineer, with headquarters at Little Rock, Ark.

JOHN L. CAMPBELL has resigned as chief engineer of the Northwestern Pacific R.R. (Southern Pacific System).

F. J. NANNAH, engineer of construction of the Pittsburgh & Lake Erie R.R., has been appointed engineer of maintenance-of-way.

B. W. GOODENOUGH, for several years assistant engineer with the East Bay Municipal Utilities District, Oakland, Calif., is now field engineer for Six Companies, Inc., on the Hoover Dam project, Boulder City.

Obituary

JAMES P. SCOTT, vice-president of Scott Brothers Construction Co., Inc., of Rome, N. Y., died at his home in Auburn, N. Y., on Oct. 29. Mr. Scott was 60 years old and had been associated with his brothers, Robert G. and the late William E., in the contracting business since 1897.

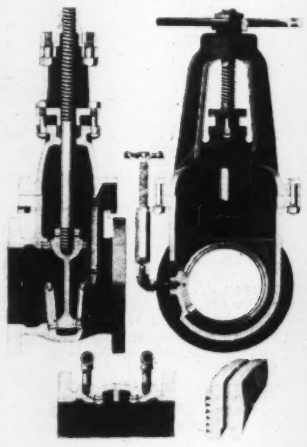
Construction Equipment and Materials

Tank Coatings Undergo Test

An extensive test of paints and other compounds used for coating the inside surfaces of steel tanks used for water storage is being conducted by the Pittsburg-Des Moines Steel Co. in conjunction with the borough of Ambridge, Pa. The inside and bottom of a 1,000,000 gal. tank at Ambridge have been divided into 196 sections, each of which is painted with a different compound or coating material. The test includes lead and oil, asphalt, coal tar, aluminum and other paints as well as enamels and coatings made of Bakelite, rubber and other special materials. Each time the tank, which is in regular service, is emptied an inspection will be made and the various materials graded by a committee. Reports will be issued at intervals and a final report upon completion of the test.

Gate Valve Sealed by Lubricant

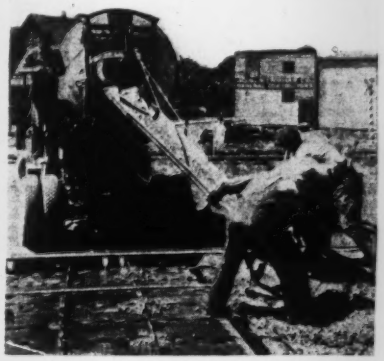
A gate valve in which a lubricant seal between the seating surfaces, introduced through a duct system, assures an absolutely tight seat, has been announced by Reading-Pratt & Cady Co., Inc., Bridgeport, Conn. It is made in both standard and extra-heavy iron patterns, as well as of electric cast steel, and has general dimensions the same as non-lubricated valves so that replacement can be made without changing piping in any way. These valves can be used without lubrication, if desired, as they seat absolutely tight. Use of the lubricant seal, however, introduces several advantages, including a tight seal despite scratches, deposits or corrosion of the seating surfaces, much easier operation, protection from corrosion and unusually long life. Only a small amount of lubricant is needed for an application, this being supplied in various forms for different services, such as air, gas, water or chemicals.



Construction of Lubrotite valve

Hoist Raises Discharge Chute of Truck Mixer

A new hoist attachment for the line of Rex Moto-Mixers and Moto-Agitators produced by the Chain Belt Co., Milwaukee, Wis., has been developed in cooperation with the Heil Co., also of Milwaukee. A hydraulic hoist fitted to the rear end of the truck chassis raises the discharge end of the mixer drum 8 ft. clear of the ground. From this height the concrete can be spouted over an area approximately 75 per cent greater than heretofore. The rate of flow of concrete is regulated easily by a simple handwheel control. Although the mixer is raised at a considerable angle, the drum empties itself cleanly and thoroughly.



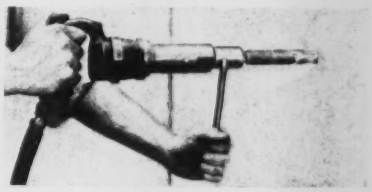
Rear hoist extends concrete chuting area

Four-Cylinder Power Units

A new line of small, modern four-cylinder engines and power units designed and built for heavy-duty purposes has been announced by the Hercules Motors Corp., Canton, Ohio. This is the Series IX, which is available in two sizes, with bores of 3 in. and 3¼ in. and piston displacements of 113.1 and 132.7 cu.in., respectively. Both sizes have a stroke of 4 in. The new models embody the usual Hercules fundamental characteristics and simplicity of design and construction, and are arranged to accommodate all modern accessories.

Self-Drilling Expansion Shells

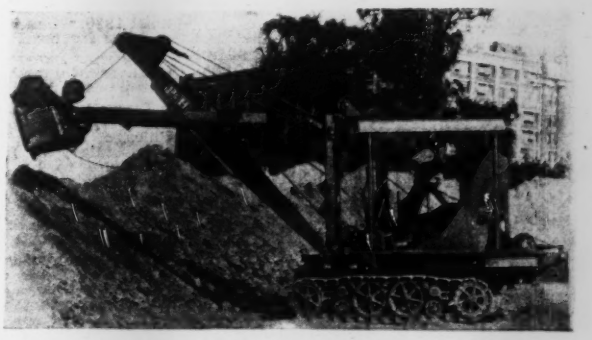
Installation of bolts, rod or strap hangers and flush shells in concrete or stone masonry is possible in an average time of one minute through the use of Phillips self-drilling expansion shells, manufactured by the Phillips Drill Co., 1537 Cortland St., Chicago, Ill. These are available in sizes up to 1 in. in diameter, all threaded types being equipped with U. S. standard thread. A pneumatic hammer is used for installation, the shell itself acting as a drill. Using a special chuck, the shell is fitted into the hammer, which is held and throttled with one hand, while the chuck is operated with the other. As the shell is hollow, it acts as a core drill, so that the operation proceeds rapidly. When the hole has reached its final depth the shell is removed, the core shaken out, the hole cleaned by compressed air, and an expanding plug inserted in the cutting end. This is then replaced in the hole with the plug against the bottom, and a few blows of the hammer drive it home to form a permanent and dependable insert.



Installing expansion bolt in concrete wall

Light, Half-Swing Excavator

Many unusual features are embodied in the model 45 convertible half-swing excavator recently announced by the Harnischfeger Corp., Milwaukee, Wis. This machine has ⅜-cu.yd. bucket capacity as shovel, dragline or clamshell crane. Conversion from one to another requires simply a change of booms; the same drums are used for



¾-cu.yd. half-swing power shovel

any attachment. Unusual rigidity and permanent alignment of gears and shafts are assured by a frame made of one piece of cast steel. The use of heat-treated alloy steels gives assurance of long life and low maintenance cost. To insure maximum accessibility, gears and shafts are located at the top of the main frame and drum clutches and brakes are of the external band type. Complete control of the machine is possible without leaving the operator's seat. Steering is facilitated through positive control of the corduroy tracks. The machine has a travel speed of 1¼ m.p.h., a hoist line speed of 300 ft. per minute, a dragline speed of 150 ft. per minute and a swinging speed of 2¾ r.p.m. in a 180-deg. arc.

New Blueprinting Process

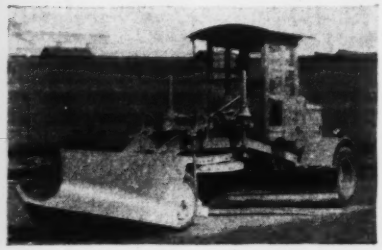
A simplified procedure known as the Kyano process for making blueprints and blue-line prints has been announced by the C. F. Pease Co., 813 North Franklin St., Chicago, Ill. Advantages claimed for this new development include the elimination of all bleeding, or the running of blues into whites; the production of a deep, rich blue from fast printing papers; satisfactory results with paper slightly turned by age or exposure; and a greater range of printing speeds.

The chemical used is furnished in dry, pulverized form, with instructions for mixing. Sufficient solution for one day's work is poured into the supply tank of the blueprinting machine in the regular manner. Developer is applied to the exposed paper by two rollers of stainless steel which revolve in a puddle of the solution. Following the double application of the Kyano solution to the exposed paper, the blues and whites form immediately. Surplus chemical is washed from the paper by a spray jet and the prints are then ready for drying.

Installation of the Kyano process is possible on any model of Pease blueprinting machine, whether new or old. It does not interfere with the use of the machine to run negatives or brown-line prints.

Snow Plow Attachment for Maintenance Grader

By adding a V plow blade with power control to its auto patrol maintenance grader (*ENR*, May 14, 1931, p. 829), the Caterpillar Tractor Co., Peoria, Ill., has produced an efficient piece of equipment for snow moving which is also serviceable for year-round maintenance work. Such a unit, it is believed, will be a great service to municipalities that cannot justify the purchase of large equipment for snow fighting exclusively. The blade is so designed as to move the drifted snow to one side with minimum of effort, allowing the unit to plow through drifts of appreciable depth. Full traction is assured by the absence of a differential, so that both wheels obtain a positive grip upon slippery surfaces. The scarifier attachment can readily be used to break up ice or frozen snow.



V-type snow plow on grader

New Welding Torch

A new welding torch known as Style 9800, designed for medium and heavy classes of oxyacetylene welding, has been placed on the market by the Air Reduction Sales Co., Lincoln Building, New York City. Important features of this torch include a ribbed handle, new type mixing head nut, oxygen and acetylene ball-seat type needle valves which are easily repacked, and an unusually soft flame characteristic. The latter is achieved by reversing the conventional method of bringing the gases to the tip. In this torch the oxygen enters the torch head at the side and the acetylene through the center. A complete assortment of tips is available.

Business Notes

U. S. Bureau of Standards, Washington, D. C., is requesting acceptances from producers and users of granite curbstone of a standard size 5 in. wide and 16 in. deep.

American Zinc Institute, Inc., New York City, announces that a number of manufacturers, representing a substantial majority of the industry, have been licensed to use the "Seal of Quality" trademark of the Institute on galvanized sheets carrying a zinc coating heavier than that of regular commercial sheets.

Steel Watermains Association, Inc., has been formed by a number of steel pipe manufacturers to develop general publicity, to establish closer and more rational relations between buyers and fabricators and to assist customers in the development and preparation of projects by supplying them with reliable data. Charles V. Witt, Huff Building, Greensburg, Pa., is chief engineer and general manager.

Lincoln Electric Co., Cleveland, Ohio, has been appointed general industrial distributor for Blackor, a super-abrasion-resistant facing. Blackor is a black granular material of high-grade tungsten carbide for application to tools subject to abrasive wear. It is applied with a carbon arc.

General Water Treatment Corp., New York City, has acquired the business of the American Zeolite Corp., which will hereafter manufacture the synthetic zeolite Decalso at Birmingham, N. J., under a license granted by the Permutit Co. The General Water Treatment Corp. was organized in 1930 and at that time acquired the Permutit Co. and the Ward-Love Pump Corp.

General Electric Co., Schenectady, N. Y., has appointed Harry L. Erlicher purchasing agent to succeed L. G. Banker, who retired on Oct. 1 after 43 years of continuous service with the company.

International-Stacey Corp., Columbus, Ohio, announces the purchase of all the stock of the Stacey Mfg. Co., Cincinnati, Ohio, one of the largest companies in the country devoted to the design and fabrication of gasholders and other high-pressure tankage.

Permutit Co., New York City, announces the return of Francis D. West to its organization as district sales manager at Buffalo, N. Y. Mr. West was associated with the Permutit Co. from 1918 until 1930, when he left to become manager of sales for the Paradon Co.

Stanton Ironworks Co., Ltd., near Nottingham, England, is now supplying spun-iron pipes in lengths of 3, 4, 5 and 6 yd.

Link-Belt Co., Chicago, Ill., announces the merger of the George W. Moore Co., Chicago, with H. W. Caldwell & Son Co., a subsidiary of Link-Belt. The combined units are to be known as the Caldwell-Moore division of the Link-Belt Co. Max H. Hurd, formerly president of the Moore company, becomes vice-president of Link-Belt in charge of the new division. His headquarters will be in Chicago.

The Ashphalt Institute, 801 Second Ave., New York City, is planning to extend activities to the Pacific Coast as the result of a substantial increase in membership. Seven new companies have joined the Institute: Standard Oil Company of California; Union Oil Company of California; Shell Oil Company of California; Associated Oil Co., of San Francisco; Gilmore Oil Co., of Los Angeles; Colonial Beacon Oil Co., of Boston; and Indian Refining Co., of Lawrenceville, Ill. The Institute expects to establish a branch office in San Francisco in the near future.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has appointed Ralph Leavenworth general advertising manager, in charge of all advertising and publicity activities of the company.

Tips, Inc., 515 Cathedral St., Baltimore, Md., has been organized to distribute cutting and welding tips, apparatus and accessories. Otto W. Dieffenbach, formerly secretary of the Black & Decker Mfg. Co., Towson, Md., is president of the new organization.

Vitaglass Corp., 100 East 42d St., New York City, announces the election as president and director of Milton T. Clark, formerly president of the Campbell Industrial Window Co. and vice-president of the Truscon Steel Co. Percy H. Jennings, formerly president of the Vitaglass Corp., has been made chairman of the board of directors and treasurer. With the inauguration of production at its own modern plant at Clarksburg, W. Va., the company has introduced radical reductions in the price of its product and has extended its distribution system.

American Manganese Steel Co., Inc., Chicago Heights, Ill., has appointed E. R. Dougherty to its sales organization, with headquarters at Chicago.

Union Chain & Mfg. Co., Sandusky, Ohio, has appointed C. H. Upson its representative in the Cincinnati territory.

Westinghouse Lighting Institute, in the Grand Central Palace, New York City, has been turned over without cost to the Electrical Association of New York, Inc., by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Ralph Neumuller, former director of the Institute, will assume the managing directorship of the association, supervising both market development and electrical institute activities.

Biggs Boiler Works Co., Akron, Ohio, announces the appointment of Alfred C. Fickes as sales manager. Mr. Fickes for the past eight years has been general sales manager of the Lancaster Iron Works, Lancaster, Pa., and was previously connected with the Philadelphia & Reading Coal & Iron Co., Lehigh Coal & Navigation Co., Southern Pipe Line Co., Bethlehem Steel Corp. and McClintic-Marshall Construction Co.

Albert J. Sayers, head of the coal tipple and coal washery departments of the Link-Belt Co., Chicago, Ill., died Oct. 11 at the age of 61. He was born at Troy, Ohio, was graduated from the University of Illinois with the class of 1895, and joined the Link-Belt organization in 1899.

Charles L. Heisler, locomotive and pumping engine designer for the General Electric Co., Schenectady, N. Y., died Oct. 13 at his summer home near that city. He was 69 years old. Mr. Heisler was born at Wapakoneta, Ohio, and worked virtually his entire life at designing and inventing. Among his inventions are included a geared locomotive, steam road rollers, waterworks pumping machinery and a number of appliances and auxiliaries for locomotives.

Business Side of Construction

Public Contracts for 10 Months Are Ahead of 1920-30

CONTRACTS for the ten months of this year average 219 millions per month against 281 millions in 1930 and 355 in 1929. The total for October is 225 millions, compared with 243 and 330 in October, 1930 and 1929. The division between public and private work last month was 106 and 119 millions respectively.

Private construction continues at low ebb—1½ per cent and 46 per cent respectively below October, 1930 and 1929. For the ten months the drop is 42 and 41 per cent for the two years.

Public Works—Bridge contracts in October exceeded the values for either of the preceding years, as did excavation, federal government and unclassified work. Streets and roads totaled 29 millions, compared with 48 and 52 millions in 1930 and 1929. The building total was 25 per cent below that of last year but 15 per cent above 1929. Classes ahead of both the last two years for the ten months are waterworks, bridges and federal work (75 per cent increase). Roads are 8 and 1 per cent below; buildings, 16 per cent below both years.

Private Works—Buildings for the month totaled 105 millions, compared with 108 millions a year ago and 203 in 1929. Unclassified construction, including public utilities, totaled 13 millions, and 12 and 15 millions for October, 1930 and 1929. For the ten months the percentage drops below 1930 and 1929 are: industrial buildings, 50 and 69 per cent; commercial buildings, 43 and 66; bridges, 42 and 71; other structures, 73 and 23 per cent.

Geographical Distribution — The month's contracts were heaviest in the Middle Atlantic states, as usual, and totaled 120 millions, compared with 81 millions last year and 180 in October, 1929. In New England private work was heavier than in either 1929 or 1930; and in the South, heavier than in 1929.

The cumulative figures show public-works construction ahead of last year's volume in New England, the South and the Far West, and about the same in the region between the Mississippi and the Rocky Mountains. Declines of 9 and 12½ per cent are recorded in the Middle Atlantic states and the Middle West. Regional percentages to total public-works volume are given in the accompanying table.

DISTRIBUTION OF PUBLIC WORKS

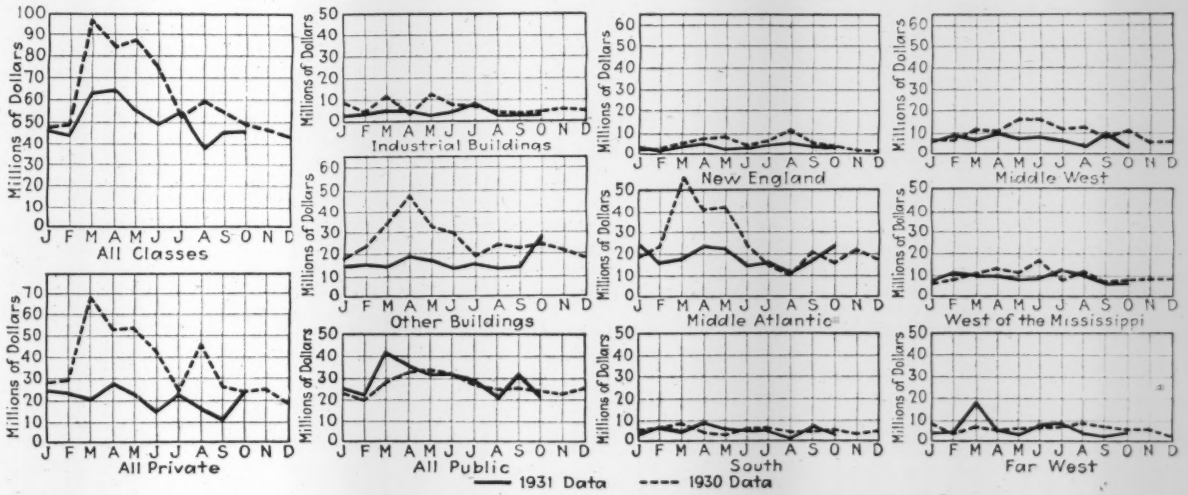
	—Per Cent— 1931	1930
New England	7.8	6.8
Middle Atlantic	28.6	32.9
South	14.4	12.4
Middle West	16.7	20.1
West of Mississippi	16.9	17.9
Far West	15.6*	9.9
United States	100.0	100.0

*Includes Hoover Dam

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN OCTOBER, 1931

Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States Oct., 1931	United States Ten Months 1931	United States Ten Months 1930	Canada, Oct., 1931
Waterworks	$105	$176	$263	$441	$1,701	$352	$3,038	$50,683	$42,313	$307
Sewers	158	1,002	254	2,636	519	607	5,176	60,438	71,873	993
Bridges, public	213	1,580	9,451	1,863	1,351	1,357	15,817	112,354	95,952	82
Excavations	517	292	244	272	45	254	1,624	19,438	22,091	73
Streets and roads	4,507	6,996	2,779	4,314	6,114	3,993	28,703	483,093	525,545	1,305
Federal government	1,179	5,300	4,634	1,084	3,116	3,508	18,821	242,116	95,422	.....
Unclassified, public	619	5,914	80	185	182	1,128	8,108	72,595	88,832	3,204
Buildings, public	4,222	10,769	377	5,377	1,271	2,810	24,826	218,935	260,390	.....
Total public	11,520	32,029	18,082	16,172	14,299	14,011	106,113	1,259,652	1,202,418	5,964
Buildings, industrial	1,338	10,403	840	1,190	1,092	4,278	19,141	148,918	299,024	1,090
Buildings, commercial	3,550	76,235	.....	2,014	1,137	3,192	86,128	513,791	908,483	2,150
Bridges, private	.....	150	.....	.....	300	.....	450	10,359	18,086	.....
Unclassified, private	255	913	40	315	11,443	375	13,341	257,567	383,099	25
Total private	5,143	87,701	880	3,519	13,972	7,845	119,060	930,635	1,608,692	3,265
October, 5 weeks	**16,663**	**119,730**	**18,962**	**19,691**	**28,271**	**21,856**	**225,173**	.....	.....	**9,229**
September, 4 weeks	12,998	71,699	20,780	39,080	22,478	9,921	176,956	.....	.....	15,444
October, 1930, 5 weeks	19,166	81,090	25,594	52,502	33,712	30,874	242,938	.....	.....	15,673
Ten months, 1931	164,388	848,666	216,888	334,198	353,257	272,890	.....	2,190,287	.....	100,531
Ten months, 1930	242,214	1,134,137	232,949	484,255	426,341	291,214	.....	.....	2,811,110	162,010



Contracts awarded, showing trend by classes and sections

Labor Conditions

Members of the National Association of Building Trades Employers assume that while an oversupply of apartments, office and industrial buildings does obviously exist, there is a general shortage of dwelling houses. Moreover, there is much to be done in the way of slum and tenement clearance and rebuilding. Promising prospects are: Boston, Albany, Philadelphia, Louisville, Omaha, Kansas City, Duluth, St. Paul, Los Angeles, San Francisco, Portland and Seattle. Local labor conditions are as follows:

Boston—Encouraging increases reported in operations among textile, shoe and electrometal plants, but construction lagging. Employers' suggestion, recently made, that building wages be reduced has received no response from the crafts.

Niagara Falls—Bricklayers and stone masons voluntarily reduced wages $2 per day, to $10, effective until April 1, 1932.

Albany—State Economic Council has filed with superintendent of public works complaint against fixing common labor rates on Albany-Rensselaer and Troy-Menands bridges at union scale of 75c. and 60c. to 68c. per hour, respectively. Attention is called by the council to the fact that common labor is working at as low a rate as 50c. per hour in New York.

New York—Five-day week provision to be incorporated in all city contracts in order to afford employment to a larger number of men.

Philadelphia—Master carpenters consider wage agreement with union abrogated because of willingness of men in many instances to accept work below scale. Reduction accordingly authorized, without consent of union, to a scale ranging from 80c. to $1 per hour, against official rate of $1.25. Union to seek an injunction. In the event that court procedure fails, the union has indicated that it will strike.

Baltimore—In reply to charge by Maryland director of employment that men from other states were obtaining jobs on public projects at the expense of local workers, state road commissioner states that only skilled men such as steam-roller and steam-shovel operators are brought in where such workers are not available locally.

Pittsburgh — November will show marked improvement in employment at the steel mills. Carnegie mills at Homestead will put on 4,000 men, while those at Braddock will add 3,000.

Memphis—Wage cuts, with the consent of the mechanics, will become effective Dec. 1, as follows: painters, $1 per hour, to $8; plasterers, $1.50, to $11; plumbers, $2, to $10; steamfitters, $2.50, to $10. Bricklayers' cut may be either $1 or $2.50, undecided.

Columbus (Ohio)—Bricklayers' union agrees to cut of 26¼c. per hour, to $1.30, which rate has remained in effect since 1926. New agreement contains five-day week clause.

Indianapolis—Nine-mile sewer project, work on which has been delayed since June, 1930, will provide employment for 3,000 men in November.

Chicago—Voiding of state prevailing-wage law by supreme court ruling has caused suspension of work on public projects for at least 50,000 men. This period of enforced idleness began in the summer and is likely to grow worse as cold weather advances. The direct cause of the tie-up on public work is outlined as follows: The state passed a prevailing-wage law; all existing state contracts were scrapped and readvertised for bids; wage law declared invalid by court decision; contracts scrapped again, which action will necessitate readvertisement for bids. Work will be afforded 900 men during November at city water-pipe extension and relaying of old mains. Two-week shifts will be instituted in order to spread out work more evenly among the men. Planning of made-work will be on a much larger scale this fall and winter, as the result of the success encountered in carrying out last year's program.

Detroit — Ten-million dollar state highway program, which will afford employment to 30,000 heads of families, launched on following plan: Contractor will submit bill for his work to the state for certification; bill then will be sold by contractor to a bank; latter will collect from the state, which in turn derives revenue from automobile weight and gasoline taxes, respectively. Proposed sewer extension, for $1,100,000, would give employment to 1,035 men for six months. If, on the other hand, this money were retained in the welfare fund, it would maintain 6,530 persons throughout the winter, according to the city comptroller.

Minneapolis — A made-work program, consisting mainly of grading and street repair, will provide employment at cash wages for 100 men, who formerly received rent, food and fuel orders from the public relief department without giving any form of service in exchange. It is stipulated, however, that no job in the made-work plan will be granted unless the applicant has first found it necessary to apply for charity.

Sioux City—Voluntary wage reduction made by two crafts: bricklayers, 25c. per hour, to $1.25; carpenters, 12½c., to $1.

St. Louis—About 110,000 sq.ft. of new factory floor space added in October. Employment, however, will be afforded to not more than 312 additional workers. Electricians announce plan for formation of a new union, later to be affiliated with the American Federation of Labor. New organization will likely drop present practice of adding insurance charge of 35c. per hour to wages of journeymen and 25c. to those of apprentices.

Dallas — Bids rejected on $21,000 water-line project, and work manned instead by unemployed men furnished by the welfare bureau. It is thought that competitive bidding, while less costly, probably would not result in the employment of the men most in need of work.

Salt Lake City—Decision of secretary of labor invoked in controversy arising out of acceptance of union scale as prevailing wage, on local federal building project. Contractor paid rate, it is alleged, $2 to $3 per day less than official union schedule. At least 5,000 men will be afforded employment on storm-sewer project, first unit of which is to be accomplished by local hand labor.

Los Angeles — Temporary employment granted to 1,300 additional workers on water and power developments. County highway maintenance will provide work for several hundred additional men on part-time basis during the winter.

San Francisco—State department of public works will provide employment for an additional 3,800 men during winter, owing to advancement of construction schedule by one year. Three days work a week, at $4 per day, will be allowed each man. Impartial wage board adopts following eight points: Present wage scale to hold for 1932; five-day week; eight-hour day, with recommendations for a possible six-hour day; time and a half for overtime; double time for Saturdays, Sundays and holidays; registration and regulation of emergency and repair work; employment of improvers or helpers, except in four special trades, to constitute violation of contract; formulation of rules governing number of apprentices for each craft. By way of compelling wage-cutting firms to come up to scale, the following means have been suggested: Induce bankers to refuse loans to wage-cutting contractors; have industrial associations control sale of building materials, refusing those who do not pay full scale; police each job to see that scale is paid; open all bids in public, each bid accompanied by certified check.

Portland (Ore.)—Wage rate of 37½c. per hour (eight hours) established for relief employment on state highway work. Between 15,000 and 20,000 men will receive employment on road work this winter.

Labor Productivity in Five Cities

Man-hour output of construction labor for the years 1926 to 1931 inclusive (to July), was given for eighteen cities in *Engineering News-Record*, Aug. 6, 1931, p. 236. These labor output or productivity figures were in percentages of 1926 output, which is taken as 100. The yearly averages are plotted on the construction index number chart appearing in this section in the first issue of each month.

The figures have since been obtained for the five cities tabulated herewith, thus making a total of 23 cities for which these data have been obtained. The former averages have been slightly revised to the following values: 1926 equals 100; 1927 equals 99½; 1928 equals 99½; 1929 equals 105; 1930 equals 114; 1931 equals 117½.

	1927	1928	1929	1930	1931
Babylon, L. I., N. Y.	98	97	98	108	110
Bloomington, Ill.	100	100	100½	125	137
Bethlehem, Pa.	110	110	100	90	90
Greensboro, N.C.	100	...	...	...	105–110
Seattle	100	100	117	119	122

Seattle — Emergency program approved, whereby practically the full list of unemployed (4,100) will be given employment at work of cutting through streets and also on other public improvements.

Wage Rates—The average wage for skilled building trades mechanics for the country is $1.16 per hour, compared with $1.17 in October and $1.39 in November, 1930. The average rate for common labor is 45.59c. per hour, compared with 45.84c. in October and 55.87c. in November, 1930.

Materials Prices

While the railroads were not granted the requested flat increase of 15 per cent on freight rates, advances were approved which will increase materials costs per 100 lb. as follows: Crushed stone, lumber, shingles and lath, 0.3c.; asphalt, stone, pig iron, scrap iron and steel, 0.6c.; cement, brick, hollow tile and lime, 1c.; all other materials, 2c.

Freight loadings of building materials are below those of a year ago by the following percentages: prepared roofing, 5.8; iron and steel, 11; lumber, 11.8; lime and plaster, 16; concrete aggregates, 18.1; clay products, 18.3; cement, 21.2.

Steel—Demand for building, railway and automotive steel is sufficient to return 7,000 men to work in Pennsylvania plants during November. The market as a whole, however, is unsatisfactory. Weekly bookings of fabricated structural steel for the country averaged 21,000 tons in October, 27,000 in September and 52,000 tons in October, 1930. Operating capacity amounts to 31 per cent, compared with 32.5 per cent a year ago. There have been no price changes in heavy hot-rolled products. Warehouse business increased slightly in October, but not as in other years. Price of expanded metal lath and wire reinforcing has been substantially reduced, to encourage their use this winter.

Cast-Iron Pipe — Foundry base at both Birmingham and Burlington is $32, beginning Oct. 29, for 250-ton lots of Class B pipe, a reduction of $3 per ton at Birmingham and $1 in Burlington. Private consumption of pipe is in larger volume than public.

Cement — Production rate is 12,000,000 bbl. a month, compared with 16,000,000 a year ago; shipments 14,000,000 bbl., against 18,000,000 last year; stocks 1,000,000 barrels heavier than in 1930.

Lumber—West Coast mills report a slight increase in firmness in prices on rail shipments. The advance, about 15c. per 1,000 ft., is perhaps the first result of a now generally accepted principle whereby the output is brought at least somewhere within hailing distance of consumption. The Southern pine mills, with one or two exceptions, are likely to follow the lead of the mills in the Northwest in fitting output to demand. In the Northern hemlock, California and Western pine regions, production is much heavier than orders warrant. Wisconsin mills have taken the initiative in reaching an agreement with the state, to set the production pace at 28 per cent of the 1927-29 yearly average, until July 1, 1932. This plan, it is believed, will insure a certain amount of employment in the mill districts and will also prevent complete shut-down in any one mill. The United States Timber Conservation Board recommends that stocks be reduced 4.6 billion feet in one year. This quantity happens to represent approximately the amount now on hand at all soft-wood mills combined. Rapid liquidation is scarcely possible under present conditions, even with cessation of cutting. The retail lumber yards in all sections of the country are going out of business or are being absorbed by other yards in increasingly larger numbers. In Arkansas, Kansas, Missouri and Oklahoma, 74 yards have closed in the last year. Among the manufacturers the opinion is held that the rate of mortality found to exist in the Southwestern territory may soon extend to other sections. The absorption of stock by the surviving yards has deferred buying of even the usual volume of new material from the mills. At New York pine 3x12s are down $2 per 1,000 ft., to $63, and $1.60, to $31, for fir, delivered.

Railway Ties—After a short period of fairly steady prices, declines are reported in Birmingham and St. Louis yards.

Brick—Price is down 50c. per 1,000, to $10, at Minneapolis, and $1, to $12, in Dallas. Other markets are steady.

Lime — Eastern sources were unaffected by price changes during the month. Hydrated finishing down $3 per ton, to $22, at New Orleans, and $1.50, to $17.30, in San Francisco.

Capital and Contracts

New capital issued in the week ended Oct. 31 consisted of a lone offering of New York City 4¼s, $5,000,000. Last week's single issue also was floated by New York City—$20,000,000 4¼s.

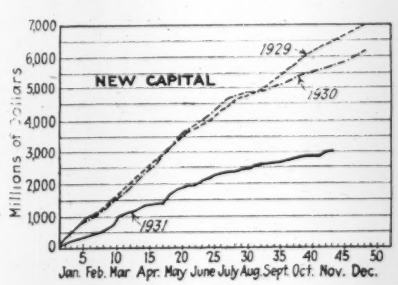
The weekly average of new financing for October was $16,000,000, compared with $81,500,000 in September and $78,000,000 in October, 1930. •This week's contracts, with comparisons, are as follows:

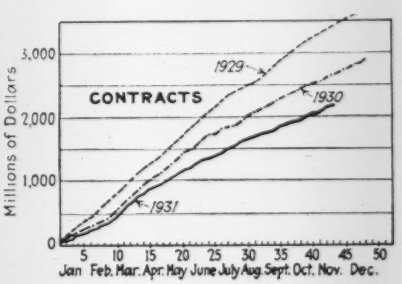
(In Thousands of Dollars)

	Nov. 5, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$2,564	$2,569	$3,105
Other	4,752	22,950	25,051
Streets and roads	5,676	4,909	6,741
Other construction	7,831	9,812	8,516
Total	$20,823	$40,241	$43,413

Total, all classes, Jan. 1 to Nov. 5:

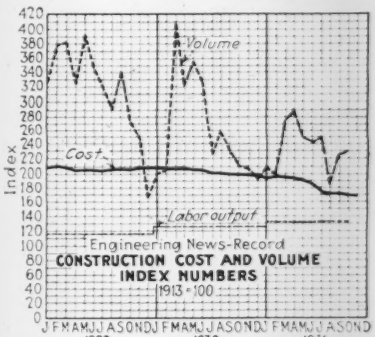
1931	$2,211,110
1930	2,850,693





Construction Cost and Volume Index Numbers

The cost index number (169.28) for Nov. 1 is 0.2 per cent under that for Oct. 1 and 14.7 per cent below the index for Nov. 1, 1930. The November cost level is the lowest since June, 1922, at which time the index touched 166.62. The October volume index (229) is 1.7 per cent greater than that for September. Moreover, it is 8.5 per cent greater than that for October, 1930.



E. N.-R. Cost		E. N.-R. Volume	
Nov., 1931	**169.28**	**Oct., 1931**	**229**
Oct., 1931	169.78	Sept., 1931	225
Nov., 1930	198.54	Oct., 1930	211
1930 (Average)	202.85	1930 (Average)	260
1929 (Average)	207.02	1929 (Average)	317
1913 average	100.00		
1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95	August	259
September	199.58	September	232
October	198.72	October	211
November	198.54	November	207
December	196.86	December	192
1931		1931	
January	194.48	January	208
February	196.61	February	198
March	194.51	March	278
April	191.63	April	289
May	189.33	May	251
June	187.23	June	243
July	174.37	July	248
August	171.38	August	187
September	171.40	September	225
October	169.78	October	229
November	169.28		

Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type**; declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, for cement in cloth, *without including charge for four bags at 10c. each*. Cash discount not deducted. Prices are delivered by truck to contractors at site of job:

	Nov. 5, 1931	One Mo. Ago	One Yr. Ago
Atlanta	$2.15	$2.15	$3.00
Baltimore	*1.90*	1.95	2.60
Birmingham	2.40	2.40	2.60
Boston	2.20	2.20	2.40
Chicago	1.95	1.95	2.20
Cincinnati	1.60	1.60	2.94
Cleveland	1.25	1.25	2.80
Dallas	1.88	1.88	2.15
Denver	2.40	2.40	2.61
Detroit	*1.90*	2.08	2.60
Jersey City	1.79	1.79	2.60
Kansas City	*2.00*	2.10	2.60
Los Angeles	2.50	2.50	1.92
Minneapolis	2.15	2.15	2.50
Montreal	2.18	2.18	2.20
New Orleans	2.01	1.95	2.60
New York	1.60	1.60	2.10
Philadelphia	1.95	1.95	2.10
Pittsburgh	1.81	1.81	.....
St. Louis	1.85	1.85	2.15
San Francisco	2.44	2.44	2.64
Seattle	2.20	2.20	2.25

Current mill-prices per barrel to dealers, in carloads, without including charge for four cloth bags, f.o.b.:

Alpena, Mich	$1.20	Mason City, Ia	$1.10
Buffington, Ind	1.10	Norfolk, Va	1.61
Dallas, Tex	1.74	Northampton, Pa	1.21
Hannibal, Mo	1.10	North Birmingham, Ala	1.31
Hudson, N. Y	1.21	Richard City, Tenn	1.31
Independence, Kan	1.10	Steelton, Minn	1.61
Ironton, Ohio	1.06	Universal, Pa	1.21
Iola, Kan	1.10	Waco, Tex	1.60
La Salle, Ill	1.10	Wyandotte, Mich	1.20
Limedale, Ind	1.10		

SAND AND GRAVEL—Per ton, delivered. Gravel, sizes ¼-in. or 1½-in.:

	Gravel	Sand
Atlanta	$3.00	$2.00
Baltimore	2.35@2.55	2.08
Birmingham, per cu.yd., 2,600@2,800 lb.	2.90	2.50
Boston	1.60@1.75	.90@1.15
Chicago, per cu.yd., 3,000 lb.	1.60@1.65	1.60
Cincinnati	1.50	1.25
Cleveland, per cu.yd., 3,000 lb.	2.60	2.50
Dallas, per cu.yd., 2,750 lb.	2.25	2.25
Denver, per cu.yd., 2,700 lb.	1.80	1.35
Detroit	1.65	1.50
Kansas City	2.00	2.00
Los Angeles	2.20	1.50@1.70
Minneapolis, per cu.yd., 2,800 lb.	1.70@2.40	1.00
Montreal	1.50	1.25
New Orleans, per cu.yd., 2,700 lb.	*2.02½*	*1.28*
New York, per cu.yd., 2,800@3,000 lb.	3.15	2.15
Philadelphia	2.35@3.20	1.55@2.40
Pittsburgh	1.55	1.75
St. Louis	1.65	1.35
San Francisco	1.75	1.75
Seattle, per cu.yd., 2,900@3,000 lb.	1.85	1.85

CRUSHED STONE—Per ton, sizes ¼-in. or 1½-in., limestone, delivered:

Atlanta	$3.00
Baltimore	2.60@2.80
Birmingham	*Slag used*
Boston	1.90@2.00
Chicago, per cu.yd., 2,500 lb.	1.60@1.65
Cincinnati	2.25
Cleveland	2.60
Dallas, per cu.yd., 2,500 lb.	2.90@3.00
Denver, granite, per cu.yd., 2,700 lb.	2.50
Detroit	1.95
Kansas City	2.00
Los Angeles	2.20
Minneapolis, per cu.yd., 2,600 lb.	2.40
Montreal	*1.80@2.00*
New York, per cu.yd., 2,800@3000 lb.	3.15
Philadelphia	2.30@3.15
Pittsburgh	3.25
St. Louis	1.65
San Francisco, trap rock	1.65
Seattle, per cuyd., 3,000 lb.	3.00

CRUSHED SLAG—Prices for carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala.	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	1.10	1.10	2.25	.70
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.10	1.10	1.10	1.00
Youngstown District	1.25	1.35	2.00	1.25

CONCRETE BLOCKS—Standard, 8x8x16-in., hollow, delivered to job, each:

Birmingham (8x8x12)	$0.084	Kansas City	$0.18
Boston	.16@.20	Minneapolis	*.10*
Brooklyn and Queens	.12	New Orleans	*.18*
Cleveland	.16@.17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	20@.26
Detroit	.12	St. Louis	.14

HOLLOW TILE—Building tile per block, delivered to contractors in lots of 2,000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x12
Atlanta	$0.09	$0.12	$0.14	$0.18	$0.24
Baltimore	.105	.....	.20	.....	.26
Birmingham	.089	.122	.167	.219	.25
Boston	.082	.118	.152	.21	.35
Chicago	*.0608*	*.0704*	*.096*	*.126*	*.14*
Cincinnati	.06815	.09485	.129	.165	.184
Cleveland	.048	.066	.09	.117	.13
Dallas	.081	.107	*.141*	.....	.284
Denver	.0975	.135	.175	.2125	.25
Detroit	.08	.11	.145	.19	.215
Kansas City	.088	.11	.145	.19	.215
Los Angeles	.09425	.134	.188	.2325	.3115
Minneapolis	.0611	.081	.10605	.1302	.1737
New Orleans	**.085**	**.115**	**.16**	**.225**	**.255**
New York	.075	.125	.14	.....	.....
Perth Amboy, N. J.(f.o.b.)	.....	.....	.....	.2388	.2956
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	.041	.058	.0845	.111	.12275
St. Louis	.07	.098	.125	.17	.20
San Francisco	.0765	.105	.1765	.....	.....
Seattle	.085	.115	.18	.....	.....

BRICK—Prices delivered per thousand are as follows:

	Common	Front	Paving F.O.B. 3x8½x4-in.	Paving F.O.B. 3½x8½x4-In.
Atlanta	$13.00	$21.50	$32.00	$37.00
Baltimore	12.50	25.00@35.00	40.00	43.00
Birmingham	13.50	22.50	27.00	32.00
Boston	14.00	28.00	42.50	47.00
Chicago	12.00	.....	42.00	43.00
Cincinnati	16.00	24.00	35.00	37.00
Cleveland	12.00@14.00	21.00@28.00	33.00	36.00
Dallas	*12.00*	17.50	.....	35.00
Denver	9.00@10.00	25.00	.....	.....
Detroit	15.50	25.00	35.50	37.50
Kansas City	14.00	.....	35.00	37.50
Los Angeles	9.00	26.50	.....	.....
Minneapolis	*10.00*	30.00	.....	.....
Montreal	28.00	.....	.....	.....
New Orleans	13.00	.....	**40.00**	**45.00**
New York	11.50	29.00	45.00	50.00
Philadelphia	16.00	.....	40.00	45.00
Pittsburgh	12.00	22.00	41.00	58.00
St. Louis	14.00	22.00	35.00	35.00
San Francisco	14.00	.....	45.00*	.....
Seattle	14.00	.....	48.50	61.00

*2½x8½x4-in.

LIME—Prices delivered to job:

	Hydrated, per Ton — Finishing	Hydrated, per Ton — Common	Lump, per Barrel — Finishing	Lump, per Barrel — Common
Atlanta	$20.00	$12.50	.....	$2.50†
Baltimore	22.00	14.00	.....	2.25†
Birmingham	30.00	17.50	.....	2.00†
Boston	22.00	14.50	$4.00*	3.10*
Chicago	15.00	15.00	2.75†	1.50†
Cincinnati	13.05	10.70	.....	.....
Cleveland	12.00	10.00	2.50†	2.50†
Dallas	20.00	.....	2.35†	.....
Denver	30.00	23.75	3.80*	3.00†
Detroit	14.00	12.00	1.75†	1.65*
Kansas City	19.00	18.00	2.25†	2.00†
Los Angeles	26.00	18.00	2.00†	2.00†
Minneapolis	25.50	21.00	.....	1.70†
Montreal	18.00	.....	10.00	.....
New Orleans	*22.00*	*13.00*	*2.10†*	1.95†
New York	17.00	14.00	4.10*	3.15*
Philadelphia	18.00	14.50	18.00‡	14.00‡
Pittsburgh	13.50	13.00	4.25*	2.75†
St. Louis	22.00	18.00	.....	15.00‡
San Francisco	*17.30*	*17.30*	.....	*1.65†*
Seattle, paper sacks	35.00	24.00	.....	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

LIMESTONE—Mill blocks, f.o.b. siding, per cu.ft.:
New York: Rustic buff, $1.42; Standard gray, $1.47; Standard, $1.57; Selected gray, $1.57; Selected buff, $1.67.
Boston: Rustic buff, $1.45; Standard, $1.58; Selected buff, $1.71.
Pittsburgh: Rustic buff, $1.03; Standard, $1.18; Selected buff, $1.28.

SLATE—Roofing, f.o.b. quarry, Bangor, Pa., net, per square:

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	7.50@10.25
Medium Clear	8.00@10.50

Road and Paving Materials

PAVING STONE—Carload lots of granite blocks, 4x8x4-in., dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	135.00 per M.
Chicago, 5 in.	**3.80** per sq.yd.
Cincinnati	110.00 per M.
Cleveland	90.00@100.00 per M.
Detroit, 5 in.	3.00 per sq.yd.
Kansas City	3.75 per sq.yd.
Minneapolis, 4½ in.	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in.	120.00 per M.
Philadelphia	125.00 per M.
St. Louis, 5 in.	3.30per sq.yd.

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	1.80@2.00
Kansas City	3½	16	*2.00*
Minneapolis	3½	16	2.50
Montreal	3	16	2.63
New Orleans	3½	16	2.30
New York	3½	16	2.00
St. Louis	3½	16	2.10

FLAGGING—Alongside dock, New York, per sq.ft.:
Manhattan and Bronx, 4 ft. wide....$0.24 Queens, 5 ft. wide..... $0.26

CURBING—Prices per lin.ft., f.o.b., cutting charges not included:
New York: Bluestone, f.o.b. barge, straight, 5x16-in., rough, 90c.
Birmingham: Granite, straight, 5x16-in., 50c.; 6x20-in., 60c.; roundings, 5x16-in., 65c.; 6x20-in., 80c.
St. Louis: Class "B" straight, 5x16-in., 75c.; roundings, $1.05@$1.30.

ASPHALT—Paving asphalt, f.o.b., per ton. Packages are 350-lb. bbls. or 425-lb. drums, in carload lots:

	Packages	Tank-car or -boat
Atlanta	$18.40	$15.40
Baltimore (f.o.b. refinery)	16.00	12.00
Birmingham (f.o.b. refinery)	.....	16.50
Boston	22.00	17.50
Chicago	22.50	18.30
Cincinnati	.....	12.00
Cleveland	18.75	15.50
Dallas	19.50	.....
Denver	30.00	.....
Detroit	16.68	12.43
Kansas City (f.o.b. refinery)	16.00	11.00
Los Angeles (f.o.b. refinery)	18.00	12.00
Maurer, N. J. (Bermudez)	.....	25.00
Maurer, N. J. (Trinidad)	.....	21.00
Minneapolis (f.o.b. Twin Cities)	23.10	18.10
Montreal	17.00	13.00
New Orleans	*23.00*	*20.00*
New York (f.o.b. refinery)	16.00	12.00
Philadelphia	16.00	12.00
Pittsburgh	24@26	14@18
St. Louis	19.50	15.50
San Francisco (f.o.b. refinery)	18.00	12.00
Seattle	21.40	18.00

LIQUID ASPHALT—Residual, prices f.o.b., in tank cars, 8,000 gal. minimum, 45% asphalt, per gal.:

New York	$0.05
Birmingham	.06
St. Louis	.04
Dallas	.05

Iron and Steel

PIG IRON—Furnace, per gross ton:

Birmingham, No. 2 fdry., silicon, 1.75@2.25	$12.00
Pittsburgh, basic	*15.50*

STRUCTURAL STEEL—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill. Beams and channels, 3 to 15 in; angles 3 to 6-in., ¼-in. thick; tees, 3-in. and larger; and plates, ¼-in. thick and heavier:

Birmingham	$1.70	New York	$2.35
Chicago	3.00	Pittsburgh	1.60
Cleveland	2.95	St. Louis	3.25
Dallas	3.50	San Francisco	2.90

BARS, CONCRETE REINFORCING—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill, on bars rolled from billets, size ½-in.:

Birmingham	$1.75	New York	$2.35
Chicago	2.00	Pittsburgh	1.60
Cleveland	1.75	St. Louis	*3.00*@3.15
Dallas	2.75	San Francisco	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job:

Lb. per Sq.Yd.	New York	Birmingham	Chicago	St. Louis	Dallas	San Francisco
2.2	*$11.00*	$17.50	$10.60	$19.00	$18.00	$21.50
2.5	*12.00*	18.50	11.40	20.00	19.50	22.50
3.0	*13.50*	20.50	12.65	21.50	.....	25.00
3.4	*14.50*	22.00	13.60	22.50	24.00	27.00

WIRE REINFORCEMENT FOR CONCRETE—Plain, per 100 sq.ft., 4 in. x 4 in. triangle mesh. Manufacturers' quotations are in carloads at mills; dealers' are delivered in lots of 10,000 sq.ft. or over:

Style Number	Weight in Pounds per 100 sq.ft.	Pittsburgh Mill	Chicago District Mill	Del. From Warehouse: New York	St. Louis	Dallas	San Francisco
032	22	*$0.89*	**$0.91**	*$1.17*	$1.30	$1.63	$1.22*
049	28	*1.13*	**1.16**	*1.50*	1.70	2.00	1.55*
068	30	*1.39*	**1.42**	*1.74*	2.10	2.25	1.91*
093	45	*1.78*	**1.83**	*2.23*	2.65	2.86	2.46*
126	57	*2.20*	**2.26**	*2.75*	3.30	3.52	3.03*
153	68	*2.63*	**2.69**	*3.29*	3.95	4.20	.....
180	78	*3.01*	**3.09**	*3.79*	4.35	4.80	.....

* F.o.b.

STEEL SHEETS—Prices per 100 lb. for base sizes, delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

	Blue Annealed No. 10	Black No. 24	Galvanized No. 24
Chicago	$3.20	$3.55	$4.10
Cleveland	3.00	3.60	4.00
New York	2.65	3.50	4.00
Pittsburgh	1.85	2.15@2.25	2.75@2.80
St. Louis	3.45	3.80	4.35
San Francisco	3.65	4.15	4.65

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River:

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	5%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas.

Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Structural rivets, round head, ½-in., full kegs, per 100 lb., delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

Chicago	$3.75
Dallas	5.00
Denver	4.65
New York	4.00
Pittsburgh	2.75
St. Louis	*4.00*
San Francisco	5.50
Seattle	4.50

STEEL SHEETPILING—Base price, f.o.b., Pittsburgh, for large mill lots, per 100 lb. $1.90

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:
Per package $10.30

SHIP SPIKES—Per 100 lb., black, from warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	½-In.	⅝-In.	¾-In.
San Francisco	$5.50	$5.05	$4.90
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, $2.90 per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh	Birmingham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$1.95@$2.00	*$2.40*	$3.30	$2.40	$3.50	$2.75	$4.95

SCRAP—The prices following are f.o.b., per gross ton, paid by dealers:

	New York	Chicago	Detroit
No. 1 railroad wrought	*$5.25*	$6.50	
Stove plate	*3.50*@4.75	6.25	$4.75
No. 1 machinery cast	7.00	8.50	8.50
Machine shop turnings	2.00	4.00	4.50
Cast borings	2.50	4.00	*5.00*
Railroad malleable	*6.00*	7.00	.....
Re-rolling rails	6.25	10.00	9.00
Heavy melting steel, No. 1	*4.50*	7.75	*6.50*
Iron and steel pipe	5.50	4.50	.....

*Net ton.

FREIGHT RATES—The following freight rates per 100 lb., effective May 20, 1930, apply on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc.:

Atlanta	$0.58*	Detroit	$0.265†
Baltimore	.27†	Kansas City	.695†
Birmingham	.58*	New Orleans	.67*
Boston	.40†	New York	.33†
Buffalo	.235†	Pacific Coast (all rail)	1.15‡
Chicago	.34†	Philadelphia	.29†
Cincinnati	.265†	St. Louis	.39†
Cleveland	.185†	St. Paul	.60*
Denver	1.15‡		

*36,000 lb. †40,000 lb. ‡60,000 lb.

Railway Materials and Supplies

STEEL RAILS—Per gross ton, f.o.b.:

	Pittsburgh	Birmingham	Chicago
Standard openhearth rails	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	34.00	33.00	34.00
Re-rolled rails	24.00@28.00	.....	*32.00*

RAILWAY TIES—Prices f.o.b., per tie, for carload lots:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.00	$1.20
	Creosoted—prices on application.		
Birmingham	White oak, untreated	.90	*1.05*
	White oak, creosoted	*1.45*	*1.55*
	Southern pine, untreated	.45	.95
	Southern pine, creosoted	*1.05*	*1.40*
Chicago	White oak, untreated	1.05	1.30
	Oak, empty cell, creosoted	1.40	1.75
	Oak, zinc treated	1.49	2.19
	Southern pine, creosoted	1.38	1.94
St. Louis	White oak, untreated	.85	*1.30*
	Red oak, untreated	.80	*1.20*
	Red oak, creosoted	1.20	*1.70*
	Sap pine or cypress, untreated	.75	*1.10*
San Francisco	Douglas fir, green, untreated	.51	.73
	Douglas fir, empty cell, creosoted	1.40	1.79
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Prices per 100 lb., f.o.b., for large mill lots at Pittsburgh and Birmingham, together with warehouse prices at other places named:

	Pittsburgh	Birmingham	Chicago	St. Louis	San Francisco
Standard spikes, ⅜-in. and larger	$2.70	$2.70	$3.45	$3.65	$4.10
Track bolts	3.80	3.70	4.30	4.50	5.10
Standard section angle bars, splice bars or fish plates	2.75	3.00*	5.75	.....	.....
Tie plates	1.95	2.07½	1.95†	.....	.....

*At warehouse. †At mill.

Pipe

WROUGHT STEEL PIPE—Discounts from standard lists for delivery from warehouse, except at Pittsburgh, where prices are f.o.b. mill:

	1 to 3-In. Butt Weld		3½ to 6-In. Lap Weld	
	Black	Galvanized	Black	Galvanized
Chicago	57.3%	44.8%	53.9%	41.4%
Cleveland	53.3%	42.3%	50.8%	37.8%
New York	56.14%	43.6%	52.72%	40.18%
Pittsburgh	64%	52.5%	61%	49.5%
St. Louis	51%	38%	48%	35%

CAST-IRON PIPE—Prices per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots (250 tons and under) of pipe:

	4-In.	6-In. and Over
Birmingham mill	$35.00@36.00	$32.00@33.00
Burlington (N. J.) mill	35.00@ 36.00	32.00@ 33.00
Chicago	43.00@ 44.00	40.00@ 41.00
New York	38.00	35.00
Pittsburgh	43.50@ 44.50	40.50@ 41.50
St. Louis	42.80	39.80
San Francisco	45.00@ 46.00	42.00@ 43.00

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In.
Atlanta	$0.105	$0.175	$0.034	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	.135	.225	.405	$0.85	1.625	$3.18	4.38
Boston	.18	.28	.55	1.35	2.38	3.95	5.90
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.05	1.89	*3.456*	5.4325
Cleveland	.1125	.175	.3375	.825	1.485	4.824	7.38
Dallas	.23	.325	.586	1.106	1.95	3.68	5.00
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	.....
Kansas City	.21	.335	.52	1.22	1.90	3.60	.....
Los Angeles	.217	.2825	.4985	1.1865	2.034	3.93	9.00
Minneapolis	.155	.24	.50	1.15	1.85	3.45	4.60
Montreal	.30	.45	.75	1.95	2.60	.....	7.20
New Orleans	*.17*	*.28*	*.52*	*1.00*	*1.90*	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.0945	.147	.297	.80	1.44	2.304	3.28
Pittsburgh	.1575	.245	.54	1.25	2.25	4.68	7.17
St. Louis	.1295	.235	*.329*	1.05	1.80	3.20	4.40
San Francisco	.21	.30	.54	1.26	2.16	3.60	5.40
Seattle	.22	.30	.54	1.26	2.16	2.50	5.50

CLAY DRAIN TILE—Prices delivered per 1,000 lin.-ft.:

Size, In.	New York	Birm'ham	Pittsburgh	Chicago	St. Louis	San Fran.	Seattle
4	*$42.00**	$50.00	$80.00	$60.00	$50.00	$67.50	$60.00
6	**81 00***	85.00	110.00	100.00	85.00	112.50	112.00

*F.o.b.

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... **$0.082** Chicago.... *$0.088* Minneapolis...*$0.088*

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.25; White in oil, $13.25; Red, dry, $13.25; Red, in oil, $14.75.

CHEMICALS—Water, sewage treatment, road work, f.o.b., New York:

Sulphate of aluminum, in bags, per 100 lb	$1.25@$1.40
Sulphate of copper, in bbl., per 100 lb	*3.40@ 3.50*
Soda ash, 58%, in bags, per 100 lb	1.15@1.17½
Chlorine, cylinders, per lb	.04@ .06
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00@ 2.10
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: 5-in.,–7-ft., 6-in.; ¼-in.,–6-ft., 1-in.; ½-in.,–4-ft., 5-in.; 1-in.,–3-ft., 8-in.; 1½-in.–2-ft., 5-in.; 1½-in.,–1-ft., 8-in. Following prices are quoted by dealers per pound for ¼-in. and larger:

Atlanta	$0.26	Kansas City	$0.23
Baltimore	.225	Los Angeles	.175
Birmingham	.25	Minneapolis	.19
Boston	.20	Montreal	.185
Chicago	*.165*	New Orleans	*.20*
Cincinnati	.21	New York	.17
Cleveland	.21	Philadelphia	.21
Dallas	.285	St. Louis	.17@.175
Denver	.20	San Francisco	.175
Detroit	.185	Seattle	.175

BUILDING PAPER—Black, 50-lb. per roll of 500 sq.ft., in carloads, f.o.b., producing point $2.16

SLATERS FELT—In carloads, per roll, f.o.b., producing point..... $0.79

ROOFING MATERIALS—Prices, f.o.b. New York, delivered to contractors, in carloads:

Asphalt felt, per 100 lb	$2.50
Tar felt, per 100 lb	2.50
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFING—Prices, delivered to contractors, in carloads, f.o.b New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	$6.50
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	6.25
Slate surfaced roofing in rolls weighing 85 to 90 lbs	2.50

WINDOW GLASS—Discounts from latest jobbers' window-glass list, dated Sept. 15, 1928, at New York warehouse:

	Single Thickness		Double Thickness	
	A Quality	B Quality	A Quality	B Quality
First 3 brackets	89%	91%	88%	90%
Larger sizes	88%	90%	88%	90%

EXPLOSIVES—Price per pound for dynamite delivered:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles	$0.1725	$0.1925
Baltimore	.215	.2375	Minneapolis	.20	.225
Birmingham	.135	.157	Montreal	.20	.24
Boston	.225	.25	New Orleans	.195	.22
Chicago	.21	.2325	New York	.245	.2675
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	.234	.272	St. Louis	.1975	.2175
Denver, f.o.b.	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

Lumber

Prices Are Delivered, Per M Ft., Board Measure, No. 1 Common Rough

New York—Timbers, to contractors, at site of job in Manhattan, in 20-ft. lengths and under:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	*$45.00*	*$29.00*
3x10 to 10x10	*52.00*	*30.00*
3x12 to 12x12	*63.00*	*31.00*
3x14 to 14x14	*70.00*	*35.00*

Chicago—Timbers, pine, in 20 ft. lengths and under; fir, up to 32 ft:

	Long-Leaf Yellow Pine	Douglas Fir
3x4 to 8x8	$49.50	$47.50
3x10 to 10x10	57.00	47.50
3x12 to 12x12	68.00	47.50
3x14 to 14x14	81.00	48.50

San Francisco—Douglas fir timbers:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	$35.00	$37.00
3x6 and 8	35.00	37.00
3x10 and 12	35.00	37.00
3x14	38.00	39.00

Other Cities—Timbers, boards, etc.:

	8x8-In. x 20 Ft. and Under				3x12 to 12x12-In. 20 Ft. and Under	
	Pine	Fir	Hemlock	Spruce	Pine	Fir
Atlanta	$50.00	.....	.....	.....	$65.00	.....
Baltimore	36.00	$50.00	$53.50	$61.75	75.00	$50.25
Birmingham	46.00	.....	.....	.....	76.00	.....
Boston	51.00	46.00	47.00	*48.50*	57.00	43.00
Cincinnati	42.50	55.00	.....	.....	52.50	52.50
Cleveland	54.00	54.00	.....	.....	45.00	49.00
Dallas	55.00	55.00	55.00	55.00	55.00	**57.50**
Denver	.....	**55.00**	**55.00**	.....	.....	**55.00**
Detroit	53.00	51.00	.....	.....	65.00	51.00
Kansas City	*35.00*	*35.00*	*35.00*	.....	55.00	*40.00*
Los Angeles	.....	41.50	.....	.....	.....	42.50
Minneapolis	.....	46.25	.....	.....	.....	46.25@47.75
Montreal	.....	.....	.....	40.00	40.00	.....
New Orleans	*38.00*	*38.00*	.....	*43.00*	*63.00*	*58.00*
Philadelphia	45.00	42.00	36.00	40.00	55.00	40.00
Pittsburgh	53.00	57.00	65.00	66.00	43@57	57@60
St. Louis	*41.00*	38.00	39.00	.....	*54.00*	39.00
Seattle	.....	16.00	.....	.....	.....	15.00

	1x10 In. x 16 Ft. and Under			2x10 In. x 16 Ft. T. & Gr.	
	Pine	Fir	Hemlock	Pine	Fir
Atlanta	$55.00	.....	.....	$37.50	.....
Baltimore	53.00	$44.00	$43.75	.....	.....
Birmingham	40.00	.....	.....	55.00	.....
Boston	46.00	41.00	42.00	48.00	$45.00
Cincinnati	45.00	47.50	.....	35.00	45.00
Cleveland	65.00	54.00	.....	42.00	54.00
Dallas	60.00	.....	.....	55.00	.....
Denver	.....	**36.00**	36.00	.....	45.00
Detroit	**49.50**	45.00	.....	*43.00*	*43.00*
Kansas City	*40.00*	**40.00**	.....	35.00	33.00
Los Angeles	41.50	41.50	.....	.....	48.50
Minneapolis	65.00*	40.00	.....	45.00*	39.00
Montreal	45.00	50.00	40.00	.....	55.00
New Orleans	*39.00*	*39.00*	.....	54.00	*48.00*
Philadelphia	48.00	40.00	35.00	49.00	40.00
Pittsburgh	40.00	47.00	55.00	40.00	50.00
St. Louis	38.50	39.00	39.00	41.00	40.00
Seattle	.....	15.00	.....	.....	16.00

*Northern Pine, No. 2 Com.

PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.12	$0.165
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	.165	.215
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	.19	.235
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	.225	.345
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	.2425	.295
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	.305	.395
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.345	.435

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Waterworks			
Los Angeles	Water supply for Hollywood Dist	$2,495,300	Proposed
Streets and Roads			
Sudbury (Ont.)	Road improvement	1,000,000	Day labor
Piers and Wharves			
New York	Piers	4,099,000	Contract
Federal Government			
Phoenix (Ariz.)	Federal building	1,200,000	Proposed
Albany (N. Y.)	Post office, court and customs house	1,850,000	Proposed
Power Plant			
Augusta (Ga.)	Power plant	1,000,000	Proposed
Oklahoma	Hydro electric development	26,000,000	Proposed
Buildings			
Boston	Court house addition	3,000,000	Proposed
Erie (Pa.)	Hospital	1,000,000	Proposed
Montreal (Que.)	Post office and customs building	1,000,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Coalinga—E. J. McCroskey, city clk., rejected bids Oct. 19, 1,000 g.p.m. deep well turbine pump against total of 165 ft. Project postponed until spring. Noted Oct. 8.

Calif., Los Angeles—Dpt. Water & Power, California Bldg., new water supply for Hollywood Dist., incl. regulating reservoir, capacity 175 acre ft., pipe lines from Stone Canyon Reservoir and lower San Fernando Valley storage basins. $2,495,300. H. A. Van Norman, California Bldg., ch. engr.

Calif., Sacramento—City Council revising estimates new water supply. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs. Noted Oct. 22.

Mont., Livingston—Waterworks addition. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mo., St. Louis—Preliminary plans improving water purification facilities, incl. 5 water clarifiers and 1 additional settling basin, at Howard's Bend Plant, on Missouri River. $500,000. Private plans.

N. Y., New York—Bd. Water Supply, 346 Bway., developing Delaware River Watershed Aqueduct, from vicinity Lackawack, Ulster Co. to Croton Watershed, Putman Co. $272,000,000. Work authorized, part of 8 or 10 year program. Funds not available.

N. D., Williston—Waterworks improvements, $15,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

BIDS ASKED

Calif., Agnew—Nov. 10, by State Dpt. P. Wks., Div. Architecture, Sacramento, 100,000 gal. steel tank on concrete tower.

Mich., Detroit—Nov. 10, by D. C. Grobbel, acting secy., Dpt. Water Supply, furnishing, installing 5 vacuum feed chlorinators of zero to 300 lb. per day feeding capacity, with chlorine piping, installed in screen chamber building at Waterworks Park, $15,000. G. H. Fenkell, 735 Randolph St., genl. mgr.

N. Y., Comstock—Nov. 17 by Dpt. Correction, State Office Bldg., Albany, filters, equipment for Great Meadow Prison.

N. Y., Long Island City—Nov. 10, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, main in Elks and 45th Rds. Ankener, 21st and 68th Aves., 75th, 79th, 84th, 108th, 129th, 203rd, 205th, 217th and 220th Sts.

N. Y., Peekskill—Nov. 23, by Bd. Water Comrs., municipal Bldg., 3 m.g. additional pure water covered reservoir. P. G. Wood, supt.; adv. E.N.-R. Nov. 5.

Utah, Bountiful—See "Contracts Awarded."

Wash., Seattle—City Council bids about Dec. 28, replacing 5 mi. Cedar River pipe line between Landsburg and Lake Youngs. $750,000. H. T. Carver, city water engr.

B. C., Victoria—See "Contracts Awarded."

Ont., Westboro—Nov. 12, by A. E. Morris clk. Nepean Twp., 3,500 ft. 12 in. mains, appurtenances. $26,000. James, Proctor & Redfern, 86 Richmond Rd., engrs. Noted Oct. 29.

CONTRACTS AWARDED

Conn., Newtown—State, water system, fire protection system, rein.-con. reservoir, gate valve houses, gate valve pits, etc., to Clark Sewer Constr. Co., 631 Lindley St. Bridgeport, $62,000.

Mass., Boston—City, J. A. Rourke, comr. Dpt. P. Wks., laying, relaying water pipes and bitulithic repaving Corey Rd., Brighton, to Marrinucci Bros. & Co., 259 Quincy St., Roxbury, $14,907.

Mont., Great Falls—Water plant addition, to Ferche & Karaffa, Great Falls, $24,000; pipe, to Fozenstrom Bros. Constr. Co., Great Falls, $35,800.

Pa., Munhall—Boro, general contract pumping station, concrete receiving well and building, excav., rein.-con. brick work, water proofing, roofing, to Nicola Building Co., 6388 Pensylvania Ave., Pittsburgh, $4,590; pumps, to Chicago Pump Co., Oliver Bldg., Pittsburgh, $3,775; c.i. sanitary sewers, backfilling on 22nd Ave. and West Run Rd., to Bucci Constr. Co., 375 Boquet St. Pittsburgh, $3,448. Grand total $11,813.

Utah, Bountiful—Waterworks improvements, day labor. $30,000. Caldwell & Richards, Templeton Bldg., Salt Lake City, engrs. Noted Aug. 20.

Utah, St. George—City Council, 20,000 ft. 16 and 18 in. concrete pipe for conduit down Collonwood Wash, installation of same, force account for water supply, to Chester A. Kemp, St. George, $11,786; Noted Oct. 8 Daily.

B. C., Victoria—City, F. M. Preston, engr., City Hall, furnishing valves, pig lead for waterworks extension, to McLennan McFeely & Prior Ltd., Cordova St. E., Vancouver, $5,219—15,400 ft. 20 in. steel welded pipe, specials, to Vancouver Eng. Wks., 519 6th Ave. W., Vancouver $46,332; 8,000 ft. Hume concrete pipe, specials, to Victolia Mchy. Depot, Victoria, $54,156; c.i. pipe, to Evans, Coleman & Johnson Bros., Victoria, $28,067; valves, to Leith Murray & Co., 355 Burrard St., Vancouver, $17,853; hydrants, to Ramsay Machine Wks., Victoria, $3,422. Grand total $155 051. Installation by day labor.

Ont., Lindsay—Town, sinking 3 artesian wells, erecting houses over, and supplying transformers, to Jordan-Robert Sales Ltd., Morell St., Brantford, $27,000.

SEWERS

PROPOSED WORK

Mich., Traverse City—City retained Hoad, Decker, Shoecraft & Drury, engrs., Ann Arbor, to prepare plans, estimates intercepting sewers, sewage disposal plant, outfall sewers, trunk sewers in Main, Bay, Cass and Oak Sts. $269,425.

Minn., Rochester—Trunk line sewerage system. Election $200,000, for same. Work may be done by day labor.

N. J., Sea Girt — Sewage disposal plant. $60,000.

N. Y., Newark — Sewage treatment plant. $136,000. G. W. Holmes, City Hall, Syracuse, and L. R. Wright, Newark, engrs.

N. Y., Canisteo—Preliminary plans storm and sanitary sewerage system. W. S. Lozier, Inc., 10 Gibbs St., Rochester, engr.

Pa., Erie—Storm sewers in West Side Dist. $60,000. A. N. Aitken, City Hall engr.

Ont., Paris—Town Council 8 in. and up vitrified storm sewers in Catharine, Charles and Walnut Sts. $25,000. D. R. Brookbank, Paris, engr.

Ont., Port Arthur—For 8 in. and up plans vitr. tile sanitary and storm sewers in Brent Park Dist. $200,000. J. A. Antonisen, City Hall, engr.

BIDS ASKED

Calif., Ventura—Nov. 17, by Bd. Supervs. Ventura Co., 1,450 ft. 36 in. rein.-con. pipe line, concrete catch basins, timber bulkhead.

Mich., Sturgis—See "Contracts Awarded."

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Cleveland and 26th Sts., to S. Guerriero Co., 1024 66th St., $1,606 and $4,447 respectively; 24th Ave., to D. Cariati & P. Grande, $1,349; Conklin Ave., to Vacarro & Delasalla, $1,571. Grand total $8,973. Noted Oct. 8.

N. Y., Long Island City—Nov. 9, by G. U. Harvey, pres. Queens Subway Bldg., sewers in 164th Pl., 88th and 116th Drs., 119th and 115th Rds., 54th, 33rd, 91st, 104th, 115th, 120th, 115th, 118th, Ferndale and 94th Aves., Newburg, Liverpool, Inwood, 127th, 164th, 152nd, 148th, 153rd, Barron, 188th, 96th, 187th, 93rd, 72nd, 54th Sts.

Pa., Chester—Nov. 17, by City Council, B. Newsome, clk., at office G. H. Hunter, dir. Dpt. Streets & Public Impvts., City Hall, Contr. 15, Edgmont Ave., Relief Sewer; Contr. 17, East Side Chester River Interceptor from 9th and Sproul Sts. to Siphon Inlet Chamber. R. C. Wheeler, 36 State St., Albany N. Y., and 505 Market St., Chester, consult. engr.

W. Va., Parkersburg—Nov. 17, by City Council, G. Huber, supt. Dpt. Water Works & Sewers, sanitary sewerage system Sanitary Sewer Dist. 2. L. G. Merrill, city engr. Morris Knowles, Inc., 507 Westinghouse Bldg., Pittsburgh, Pa., consult. engrs.; adv. E. N.-R. Nov. 5. Noted Oct. 29.

Wis., Grafton—City Council taking bids sewage disposal plant, sewage relift station, clarifier, sludge bed, digester, pump house. $25,000. P. L. Clark, Appleton, engr. Noted Oct. 15.

Wis., Milwaukee—Nov. 12, by Metropolitan Sewerage Comm., 6 659 ft. special section concrete, 1,055 ft. 30 in. concrete and 2,346 ft. 24 in. terra cotta encased in concrete, main sanitary sewer in River Rd., Lincoln Park, Belle Isle and Riverview Drs.; 3,405 ft. special section concrete main sanitary sewers in Hampton Rd. and Lincoln Creek Parkway. J. L. Ferebee, ch. engr.

Ont., Westboro—Nov. 12, by A. E. Monis, clk. Nepean Twp., 3,500 lin.ft. 12 in. sewer pipes, appurtenances. $24,000. James, Proctor & Redfern, 86 Richmond Rd., engrs.

Sask., Saskatoon—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Los Angeles—See "Streets and Roads."

Calif., Los Angeles—Bd. P. Wks., City Hall, sewers, chimney, house connections in Oliver Street and Marshall Court Sewer Dist., to J. C. Hickey, 2815 West Blvd., $35,373.

Ia., Des Moines—See "Streets and Roads."

Mass., Boston—See "Waterworks."

Kan., Great Bend—Storm sewer extension, to Cook & Ransom, Ottawa, $30,003.

Michigan—H. G. Oakes, div. engr., Plymouth, constructing sewer, M063-24C-8, Oakland Co., for State Hy. Comm., Lansing, to R. D. Baker Co., Royal Oak, $26,646.

See proposal advertising on page 86

Constr. News page 167

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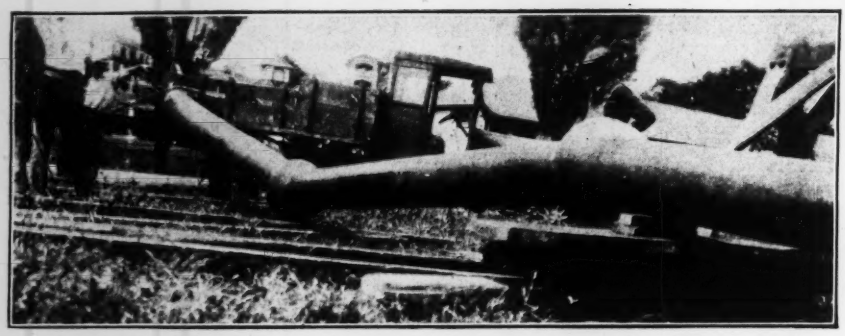

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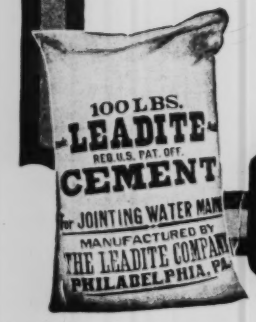

No Caulking

sewers (Continued)

Mich., Sturgis—City purchased 8,600 ft. sewer pipe and will construct main relief sewer, day labor. $25,000.

O., Cleveland—City, section Nine Mile Creek from St. Clair Ave. to East 140th St., to Carroccio & Gaudio, 14109 Benwood Ave., $50,488. Noted Aug. 27.

O., Cleveland—City, 1,053 ft. No. 5 "C" orick sewer in Parkgate Ave., from East 99th to East 105th Sts., to D. Nero, 1424 Lakeview Rd., $20,294; 1,625 ft. 2 ft. 6 in. to 4 ft. 3 in. "E" brick sewer in Fulton Rd., to Walter P. Gibbons Contg. Co., Schofield Bldg., $19,833.

Okla., Oklahoma City—M. Peshek, city clk., 12,470 ft. 24- to 42-in. concrete pipe, for Rock Island Main Sanitary Sewer, to Lock Joint Pipe Co., Ampere, N. J., $25,681. Est. $27,000. Noted Sept. 22.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., branch sewers in Church Lane and main sewer in Castor and Glenwood Aves., to E. Ventresco, 6016 Ross St., $525 and $58,166 respectively; branch sewers in Cumberland St., and main sewer in Tyson Ave. and Hasbrook St., to V. Neaman, 628 Levick St., $6,140 and $13,478 respectively; branch sewers in 11th St., to C. A. Delise & A. DeAngelo, 4842 North Leithgow St., $709; Green St. and Olney Ave., to P. and A. J. Ellis, 4th and Courtland Sts., $3,790 and $5,807 respectively; McKean St., to De Sepio & Vallone, 28th and Wolf Sts., $5,838; 70th St., to J. J. McHugh, 1617 Race St., $4,562; Woodcrest Ave., to Campellone & Diovie, 3856 North 10th St., $1,558; 56th St., to A. DiSandro & Son, 6400 North 5th St., $6,930; replacing old sewer with new in Hunting Park Ave., to R. DeVito, 6314 Dicks St., $11,761. Grand total $119,264. Noted Sept. 24.

Wis., Milwaukee — Metropolitan Sewerage Comn., concrete main sanitary sewer in 9th St. to Clayton Constr. Co., Port Washington Rd., Milwaukee, $125,262. Noted Oct. 8.

Ont. Hanover—Town, 9- to 12-in. vitr. tile sewers in David, James, John, California, Market, Queen, Sophia, Pell and Victoria Sts., day labor. $50,000. C. R. Hagey, c/o Ontario Eng. Co., Ft. Erie, engr. Noted Sept. 22.

Ont., Sarnia—City Council, vitr. tile storm sewers in Lochill St., to A. Cope & Sons Ltd., 19 Albert St., Hamilton. Est. $25 000. Noted Sept. 24.

Ont., Toronto—City Council, 12 in. and up tile storm sewers, in Keating St., Logan and Booth Aves., day labor. $114,780. R. C. Harris, City Hall, engr.

Ont., Toronto—Vitr. tile storm sewers in Avenue Rd. and Queens Park Crescent, to W. R. Worthington Constr. Co., 630 Eglinton Ave. W., $12,340 and $21,240 respectively; Darling Ave., to P. Dileo, 239 Belwoods Ave., $375; MacDonnell Ave., to Northern Ontario Co., 78 Centre St., $256. Grand total $34 211. Noted Oct. 29.

Sask., Saskatoon — City, storm sewer, day labor. $300,000. G. D. Archibald, city engr. Noted Sept. 3.

WASTE DISPOSAL

PROPOSED WORK

Ont., Toronto—City Council, concrete, brick, steel waste disposal plant, incinerating furnaces equipment, refuse handling equipment, on Symes Rd. $620,000. R. C. Harris City Hall, engr.

BRIDGES

PROPOSED WORK

Mo., Kansas City—Reconstructing 12th St. Viaduct, $90,000; widening bridge over Brush Creek, on Main St., $50,000; rebuilding bridge on Bway. near 3rd St., $26,000; widening underpass entrance, to Kansas City Airport, $25,000. R. Waddell, city engr.

Tex., Corsicana—Navarro Co., at office A. F. Mitchell, co. engr., Corsicana, returned bids unopened, Oct. 1, 4 span 190 ft., rein.-con. steel bridge over Richland Creek Bottom, Cardinal Rd. 4. To exceed $25,000. Project indefinitely postponed.

Ontario—State Hy. Dpt., Parliament Bldgs., Toronto, 4 new concrete or structural steel bridges on concrete found., concrete piers, abutments, over Credit River, Etobicoke River, Twelve Mile Creek and Sixteen Mile Creek. $750,000-$1,000,000. A. A. Smith, ch. engr.

BIDS ASKED

Iowa—Nov. 10, by State Hy. Comn., Ames, three 40 x 24 ft. I-beam bridge Rd. 77, S-574, Keokuk Co. 546 lin. ft. I-beam span bridge, 24 ft. roadway on Rd. 75, northern part Sioux City, Woodbury Co. C. R. Jones, aud.

Kentucky—See "Streets and Roads."

Michigan—Nov. 10, by A. L. Burridge, div. engr., Cadillac, F.Br. 1 of 6-12-21, Contr. 1, substructure 2 rein.-con. abutments, buttress type with heights 27 ft. 10 in. from bottom footings to crown of roadway, Arenac Co.; MBr. 1 of 57-3-2, Contrs. 1 and 2, one 60 ft. span, 2 rein.-con. abutments semi-gravity type, steel deck girder, rein.-con. floor and surface, two 2½ ft. sidewalks, Missaukee Co., for State Hy. Comn., Lansing.

Michigan—Nov. 12 by J. T. Sharpensteen, div. engr., Escanaba, FBr. 1 of 55-10-12, Contrs. 1 and 2, one 45 ft. span, 40 ft. roadway, 2 rein.-con. abutments, semi-gravity type, steel deck girder with rolled beams and rein.-con. floor and surface, two 5 ft. sidewalks, Menominee Co., for State Hy. Comn., Lansing.

Michigan—Nov. 12, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, MBr. 3 of 61-1Y-1, Contrs. 1 and 2, two 30 ft. and five 40 ft. spans 22 ft. roadway, 2 rein.-con. abutments, skeleton type, steel deck girder with rein.-con. floor, and wearing surface, one 2½ ft. and one 5 ft. sidewalks; FBr. 1 of 61-7-9, Contrs. 1 and 2, one 40 ft. span, 40 ft. roadway, 2 rein.-con. abutments, semi-gravity type, steel deck girder, rolled beams, with rein.-con. floor and surface, two 2½ ft. sidewalks, both Muskegon Co., for State Hy. Comn., Lansing.

Michigan—Nov. 13, by W. J. Kingscott, div. engr., at office Kent County Road Comn. Grand Rapids, R.Br. 1 of 41-8-20, Contrs. 1 and 2, three 75 ft. and one 28 ft. 6 in. spans, 22 ft. roadway, 2 rein.-con. abutments, semi-gravity type, steel deck girder, rein.-con. floor and surface, two 2½ ft. sidewalks, Kent Co., for State Hy., Comn., Lansing.

Okla., Lawton—Nov. 17, by State Hy. Dpt., Oklahoma City, 6 span 146 ft. rein.-con. bridge, Comanche Co., $35,000. C. R. Wilson, hy. engr.

Wash., Seattle—Bd. P. Works, City Hall, taking bids sidewalks, paving approaches to George Washington Memorial Bridge from Harrison to Lynn Sts. $260,000. D. W. McMorris, city engr.

CONTRACTS AWARDED

Iowa—See "Streets and Roads."

Michigan—H. W. Hagaman, div. engr., Saginaw, F.A. Br. 1 of 79-23-14, Contrs. 1 and 2, two 60 ft. spans, 2 rein.-con. abutments, steel deck girder with concrete floor, two 2½ ft. sidewalks, Tuscola Co., Contr. 1, to American Bridge Co., 1328 Buhl Bldg., Detroit, $3,521; Contr. 2, to Edgewater Constr. Co., Saginaw, $17,608, for State Hy. Comn., Lansing. Noted Oct. 1.

Michigan—W. J. Kingscott, div. engr., Paw Paw, S.R. Br. 1 of 80-9-22 Contrs. 1 and 2, one 55 ft. span, 22 ft. roadway, 2 rein.-con. abutments, steel deck girder with rein.-con. floor, two 1½ ft. sidewalks, Contr. 1, to American Bridge Co., 1328 Buhl Bldg., Detroit, $1,156, Contr. 2, to C. J. Price, Grand Rapids, $9,329; S.R. Br. 1 of 80-11-23, Contrs. 1 and 2, two 50 ft. spans, 30 ft. roadway, 2 rein.-con. abutments, steel deck girder with rein.-con. floor wearing surface, two 1½ ft. sidewalks, Contr. 1, to Whitehead & Kales Co., 58 Haltiner St., River Rouge, Detroit, $2,573, Contr. 2, to Lovering-Longbotham, Ann Arbor, $16,994, all in Van Buren Co., for State Hy. Comn., Lansing. Grand total $30,052. Noted Oct. 1.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., bridge under Philadelphia & Frankford Branch of Reading R.R. at Summerdale Ave., to G. F. Dobbin, 1020 South 47th St., $49,207; bridge under Philadelphia R.R. and Philadelphia, Baltimore & Washington R.R., at University Ave., to P. and J. Ellis, 4th and Courtland Sts., $229,601. Noted Sept. 24.

Texas—G. Gilchrist, state hy. engr., Austin Dry and Main Frio River Bridges, steel, concrete, Hy. 3, Uvalde Co., and steel, concrete bridge and relief bridge over Nueces River, Nueces and San Patricio Counties, to H. K. McCollum, 1507 Fort Worth Natl. Bank Bldg., Fort Worth, $101,836 and $95,852 respectively est. $120,000 and $130,000 respectively—2 concrete bridges, 2 culverts, Hy. 4 Wheeler Co., to Huddleston Constr. Co., Crosbyton, $22,584 est. $25,000. Grand total $220,272. Noted Oct. 14 Daily.

STREETS AND ROADS

BIDS ASKED

Calif., Los Angeles—Nov. 16, by Bd. Supervs. Los Angeles Co., improving 5,170 lin.ft. Center St. in vicinity Bellflower from Somerset Ave. to San Gabriel River, alternate **(B)** grading, shaping, removing trees, monolithic concrete curbing and guttering 61,792 sq.ft. 4 in. D. R. with rock and oil wearing surface paving 121,778 sq.ft., 5 in. old macadam on D. R. base paving 121,778 sq.ft., 389 lin.ft. 18 in. corrugated metal pipe, type A headwalls, furnishing, placing 60 pile butts, 13 tons asphaltic concrete wearing surface, 106,614 sq.ft. 1½ in. wearing surface, 106,524 sq.ft. 6 in. asphaltic concrete base, 10,096 sq.ft. 8 in. concrete pavement, alternate **(C)** 70,975 sq.ft. 9-7-9 in., 10,096 sq.ft. 8 in., 35,639 sq.ft. 7½ in. concrete pavement. To exceed $25,000. G. W. Jones, Hall of Records Bldg., engr.

Calif., Los Angeles—Nov. 18, by Bd. P. Wks., City Hall, grading, curbing, guttering, sidewalks, waterworks, removing 1,900 sq.ft. oiled roadway, and 6 in. concrete paving 137,099 sq.ft., 4 in. concrete paving 597 sq.ft., oil surfacing 58,592 sq.ft. Baird Ave. between Saticoy St. and Sherman Way and streets in Baird Ave. and Velerio Street Impvt. Dist. To exceed $25,000. J. J. Jessup, City Hall, engr.

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., received no bids Oct. 19, improving Orangewood Blvd. $138,000. May readvertise. G. W. Jones, Hall of Records Bldg., engr. Noted Oct. 1.

Iowa—Nov. 10, by State Hy. Comn., Ames, grading, drainage structures 2.413 mi. Rd. 78 south from Winfield, P-755 Henry Co.—filling gully adjacent to Rd. 34 near Mills-Pottawattamie County line, F-226 Mills Co., ncl. 100,000 cu.yd. earth excav. gravel surfacing 8.759 mi. Rd. 2 from Fontenell west, P-495 Adair Co.—21.901 mi. Rd. 2 from Lewis east P-651 Cass Co.—8.238 mi. Rd. 78 through Winfield, P-775 Henry Co.—4.405 mi. Rd. 42 from Riverton east, P-707—3.5 mi. Rd. 174 from Farragut north, P.793 back Fremont Co.—3.5 mi. Rd. 205 from Milo west, P-790 Wm—6.5 mi. Rd. 206 from Lacona west P-791—7.7 mi. Rd. 207 from New Virginia east, P-792, all Warren Co.—C. R. Jones, aud.

Kansas—Nov. 10, by State Hy. Comn., at office County Clerk, Olathe, sand gravel surfacing 7.4 mi. Project 50-43-7489 Douglas Co.—7 mi. Project 7-21-7490—5 mi. Project 7-23-7491, both Johnson Co.—13.75 mi. Project 77-26-7492 Marshall Co.—9.4 mi. Project 9-24B-7493 Nemaha Co. W. V. Buck, Topeka hy. engr.

Kentucky—Nov. 10, by State Hy. Dpt., Frankfort, grading, drainage structures 6.123 mi. Hickman-Union City Rd., Federal Route 90-AG. 24 and 30 ft., Fulton Co.—6.85 mi Paducah-Wickliffe Rd., Federal Aid Project 154-DG, 30 and 36 ft., McCracken Co.—10.898 mi. Jeff-Cornettsville Rd., Federal Route 66-DG, 20 and 26 ft., Perry Co.—11.2 mi. Cannel City-Hazel Green Rd., State Aid Project 29-BG, 20 and 26 ft., Morgan and Wolfe Counties—three 36 ft. span deck girder bridge, approaches on Somerset-Nancy Rd., near Somerset, Federal Aid Project 211-AB, Pulaski Co. B. Johnson, chn.

Maryland—Nov. 10, by State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 6.13 mi. Contr. A-111-64 Allegany Co.—250 ft. Contr. Ce-121-23 Cecil Co.—0.5 mi. Contr. M-178-32 Montgomery Co.—sheet asphalt paving 0.11 mi. Contr. B-194-42 Baltimore Co.—gravel surfacing 1.91 mi. Contr. C-56-84 Calvert Co.—6.43 mi. Contr. P-155-84 Prince George's Co.; adv. E.N.-R. Nov. 5.

Michigan—Nov. 10, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, partially grading road, concrete paving 3.181 mi. FO41-37C-3, Kent Co., for States Hy. Comn., Lansing.

Michigan—Nov. 10, by J. T. Sharpensteen, div. engr., Escanaba, gravel resurfacing 19.2 mi. MO7-17C-1, Baraga Co., for State Hy. Comn., Lansing.

Michigan—Nov. 12, by H. G. Oakes, div. engr., Plymouth, widening grade, lengthening drainage structures, concrete paving 6.531 mi. MO33-37C-1, Ingham Co.—widening, grade lengthening drainage structures 7.956 mi. MO63-8C-4 and MO47-1C-6 Oakland Co.—8.485 mi. MO47-15C-3, Livingston Co., for State Hy. Comn., Lansing.

Michigan—Nov. 13, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, widening grade and lengthening drainage structures 11.204 mi. MO25-4C-5, Genesee Co., for State Hy. Comn., Lansing.

Montana—Dec. 3, by State Hy. Comn., Helena, improving 11 state projects.

N. J., Freehold—Nov. 18, by Bd. Freeholders Monmouth Co., Court House, grading, 9 in. rein.-con. paving 69,755 sq.yd. Route 36, Sect. 2, Keansburg-Atlantic Highlands. G. K. Allen, Jr. Red Bank, cg. engr.; adv. E.N.-R. Nov. 5.

New York—Nov. 18, by A. W. Brandt, comr. Hys., State Office Bldg., Albany, completing road in Onondaga Co.; reconstructing roads in Fulton, Herkimer, Otsego, Rensselaer, and Westchester Counties; adv. E. N.-R. Nov. 5.

N. Y., Brooklyn—Nov. 11, by H. Hesterberg, pres., Brooklyn Boro, Boro Hall, sheet asphalt on concrete paving Beverly Rd., Newkirk, Ovington and 19th Aves., Bradford, East 31st, East 93rd, Green Lake, Main and 68th Sts.

Oklahoma—Nov. 24, by State Hy. Dpt., Oklahoma City, grading, drainage structures 6.5 mi. State Hy. 48 north of Prague, Lincoln Co. $30,000—22.64 mi. State Hy. 19 east of Atoka, Atoka Co. $90,000—7 mi. U. S. Hy. 66 east of Calumet, Canadian Co. $30,000—7 mi. U. S. Hy. 62 east of Gould, Harmon Co. $30,000—5 mi. State Hy. 34 north from Red River near Elmer $25,000—6 mi. U. S. Hy. 62 west of Duke, $25,000, both Jackson Co.—10 mi. U. S. Hy. 70 west of Ringling Jefferson Co. $40,000—8 mi. State Hy. 48 north of Tishomingo, Johnson Co. $40,000—15 mi. U. S. Hy. 270 from Hodgen to Arkansas state line, Le Flore Co. $70,000—6.51 mi. State Hy. 22 from Sulphur to Scullin, Murray Co. $25,000—7 mi. State Hy. 48 south of Ada, Pontotoc Co. $35,000, all above roads 32 ft. wide. C. L. Wilson, hy. engr.

Oklahoma — Nov. 24, by State Hy. Dpt., Oklahoma City, gravel top surfacing 9 mi. U. S. Hy. 64 from Nash east to county line, Grant Co. $25,000—10 mi. U. S. Hy. 81 from Minco to Pocassett, Grady Co. $25,000—11 mi. State Hy. 9, from Carnegie to Mountain View, Kiowa Co. $26,000—18 mi. State Hy. 14 from Snyder to Frederick, Tillman Co. $35,000—11 mi. State Hy. 11, Tulsa Co. $25,000, all above roads 20 ft. wide—grading, drainage structures 7 mi. State Hy. 48, 32 ft. Seminole Co. $30,000. C. L. Wilson, hy. engr.

Okla., Oklahoma City—M. Peshek, Jr., city clk., rejected bids Sept. 29, 7 in. concrete paving 9,600 sq.yd. South Harvey St. from Reno to Choctaw Sts., $25 490; 11,200 sq.yd. Southwest 29th St. from Virginia to Miller Sts., $46,620. Will probably readvertise. L. M. Bush, City Hall, engr. Noted Sept. 22.

Pa., Uniontown—See "Contracts Awarded."

Tenn., Chattanooga—Nov. 10, by Hy. Comn. Hamilton Co., grading, drainage structures 3 1/3 mi., Shallow-Ford Rd. from Wilcox Blvd. to Lee Hy., 31 ft. $25,000. T. S. Wilcox, Court House, engr.

Ont., Hamilton—See "Contracts Awarded."

Ont., Sudbury—See "Contracts Awarded."

CONTRACTS AWARDED

California—State Hy. Comn., Sacramento, grading, paving 0.5 mi. road 20 ft., at Bradley, Monterey Co., to S. Finley, Santa Ana, $27,392.

California—Directors Julian-Kane Springs Joint Hy. Dist., Court House, El Centro, pre-

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Streets and Roads (Continued)

mixed oil surfacing 24.49 mi. Julian-Kane Springs Hy., San Diego Co., to O. U. Miracle, 4751 Monroe Ave., San Diego, $176,391.

California—State Hy. Comn., Sacramento, grading 1.5 mi. concrete paving 2.7 mi. road between Newcastle and Wise Power House, Placer Co. to Hanrahan Co., Hobart Bldg., San Francisco, $102,965; grading, selected materials paving 8.3 mi. road between Rock Creek and San Remo Divide, Monterey Co., to D. McDonald, 1118 G St., Sacramento, $169,991. Noted Oct. 1.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, gradnig, concrete paving 5.1 mi. road in Los Angeles Co., to Jones & King, 214 East 14th St., Hayward, $116,828 Noted Sept. 22.

Calif., Los Angeles—Bd. Local Impvts., City Hall, grading, curbing, guttering, sewers, sidewalks, water service connections, ornamental lighting conduits, 8 in. concrete paving 30,921 sq.ft. 6 in. concrete paving 174,066 sq.ft., rock and oil paving 3,570 sq.ft. 98th St. and Wadsworth Ave. Impvt. Dist., to Campbell-Reichert Co., 4000 Whiteside Ave., Alhambra, $45,025. Est. $49,634.

Calif., Mill Valley—Grading, concrete and hydrated concrete paving Sycamore Ave. and Thalia St., to N. M. Ball, 1889 Yosemite Rd., Berkeley, $22,850.

Calif., Oakland—Grading 130,000 cu.yd., curbing, guttering, sidewalks, 2 in. asphaltic concrete on 6 in. concrete paving 95,850 sq.yd. Harrison St. between 20th St. and Grand Ave. to Heafey-Moore, Inc., 344 High St., $29,030.

Colo., Holyoke—Town Council, C. P. Peterson, clk., 1 in. rock asphalt and 5 in. concrete base paving, grading, to McKee & Hooper, Garden City, Kan., at $1.55 per sq.yd. for paving and $0.50 per cu.yd. for grading; furnishing rock asphalt, to Utah Rock Asphalt Co., 1st Natl. Bank Bldg., Pueblo. Total est. $30,000. Noted Sept. 3.

Connecticut—J. A. Macdonald, state hy. comr. Hartford, loose gravel surfacing 8,450 ft. by Salem, to Altieri & Petruccione, 591 Congress Ave., Waterbury—19,100 ft. Griswold and 15,600 ft. Lisbon, to F. D. Miller, Poquetanuck St., Norwich—gravel surfacing 9,850 ft. Barkhamsted, to C. A. Rossi Co., 151 Franklin St., Torrington—23,100 ft. Woodstock, to Amos D. Bridges Sons, Inc., Hazardville—7 965 ft. Winchester and trap rock waterbound macadam paving 72,260 ft. Southington, to L. Suzio Constr. Co., State and Brooke St., Meriden—gravel and waterbound macadam paving 24,650 ft. Orange, to Guyett Constr. Co., Inc., 831 Chapel St., New Haven. Est. exceeds $25,000.

Iowa—State Hy. Comn., Ames to Specketer & Sherwood, Galva, grading, drainage structures 0.341 mi. road in Cherokee Co. $2,811—to McCarthy Impvt. Co., Kahl Bldg., Davenport, 0.261 mi. Lee Co. $4,342—to C. Pope, Dubuque, gravel surfacing 4.3 mi., Benton Co. $6,480—to Evans Constr. Co., Early, 14.262 mi. Cherokee Co. $7,173—to Kriege Constr. Co., Marshalltown 9.6 mi. Harrison Co. $7,560; 4.1 mi. P-787 $8,095; 5.9 mi. P-788 $12,623, both Monona Co.; 5.856 mi. Pottawattamie Co. $13,174—to M. Baker, Olin, 5.389 mi. Iowa Co. $9,426—to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, Neb., 0.547 mi. Mills Co. $1,110—to G. E. Sargent Hampton, 7.131 mi. Mitchell Co. $4,221—to C. A. Emery, Coon Rapids, 0.631 mi. Osceola Co. $2,142—to Langfitt & Co., Cedar Rapids, 8.3 mi. Washington Co., $16,160.—to G. Gordon, Centerville, culverts in Appanoose Co., $1,769—to E. A. Kramme Co., Des Moines, culverts in Henry Co. $4,688—to O. W. Akin, Atlantic slab bridge in Woodbury Co. $2,123. Grand total $103,987.

Ia., Des Moines—City Council to Wright Constr. Co., 1325 West Maime St., widening, brick paving 4 blocks around Polk Co. court house est. $30,000; concrete paving Hartford Ave. from Southeast 6th St. to Indianola Rd. est. $10,000; brick resurfacing Locust St. from East 1st St. to East 6th St. est. $10,000. Total est. $50,000. To Gjellefald Constr. Co., Forest City, 1,360 ft. 10 in. vitr. clay sewers.

Ia., Sioux City—E. V. Moone city clk., concrete paving Jones St., to Jensen & Krage, 3722 Jackson St., Sioux City, $1,384—Douglas St. and alley, to Harrington & Jorgensen, 3904 6th Ave., Sioux City, $4,458—Silver and Turner Sts., to Hansen & Wesley, 1616 West 5th St., Sioux City, $9,000. Grand total $14,842. Noted Sept. 17.

Kansas—State Hy. Comn., Court House, Washington, to W. D. Shay, McPherson, sand gravel surfacing 6.2 mi. road in Chase Co., $2,406—to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, Neb., 2 mi. Jewell Co. $704—to San Ore Constr. Co., McPherson, 7.8 mi. Project 36-20-7483 $2,699; 11.7 mi. Project 81-24-7484 $3,042, both Republic Co.; 13 mi. Ellsworth Co. $3,068; 9.6 mi. McPherson Co. $2,669—to Thormartin & Reese, Ft. Scott, 14.4 mi. Project 9-18-7486, $4,003; 14 mi. Project 9-19-7487, $3,514, both Washington Co. Grand total $22,105. Noted Oct. 8.

Massachusetts—Dpt. P. Wks., A. W. Dean engineer, State House, Boston, rein.-con. paving 28,822 ft. hy. incl. rein.-con. bridge over Neponset River, Sharon. Walpole and Norwood, to Carlo Bianchi & Co., Framingham, $359,548—broken stone and asphalt paving 8,262 ft. Newbury and Newburyport, to Welch & Moynihan, 15 Front St., Worcester, $22,845—bituminous macadam paving 9.446 ft. Williamstown to R. E. Bull, 151 Harrison Ave., Fitchburg, $72,682 Grand total $455,075. Noted Oct. 22.

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Massachusetts—Dpt. P. Wks., A. W. Dean, State House, Botson, engr., bituminous macadam paving 29,596 ft. hy., incl. steel plate girder bridge, concrete pile extension of bridge, 2 steel, concrete bridges and rein.-con. bridge, Framingham and Natick, to B. Perini & Sons, Ashland, $646,045. Noted Sept. 24.

Mass., Boston—City, Park Dpt., 33 Beacon St., grading, concrete walks, walls, Stanley Wringer Playground, Allston, to Guaranty Constr. Co., 161 Harvard Ave., Allston, $18,439. Est. $25,000.

Mass. Boston—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Elmer Rd., to C. Capone, 44 Wellsmere Rd., Roslindale, $21,227. Est. $25,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Fenwood Rd., to Baker, Matz & Co., 1578 Tremont St. Roxbury, $24,306. Est. $25,000 or more.

Mass., Boston—Dpt. P. Wks., sheet asphalt paving Center St., to M. McGinnis Co., 65 Pershing Rd., West Roxbury, $106,348.

Michigan—W. J. Kingscott, div. engr., Grand Rapids, widening existing 16 ft. pavement to 20 ft., 5.2 mi. MO70-39C-1 Ottawa Co., for State Hy. Comn., Lansing, to Ottawa County Road Comn., Grand Haven, $32,283.

Michigan—J. T. Sharpensteen, div. engr., Escanaba, gravel resurfacing 5.5 mi. MO17-7C-4 Chippewa Co., for State Hy. Comn., Lausing, to Chippewa Co. Road Comn., Sault Ste. Marie, $31,925.

Minnesota—State Hy. Dpt., St. Paul, grading 20.4 mi. S.P. 1-45, Sect. 2, to W. W. Magee, Commercial State Bank Bldg., St. Paul, $473,207—4.1 mi. S.P. 3-53, Sect. 3, to C. W. McNamara, Sioux Falls, S. D., $15,862—7.5 mi. S.P. 4-50, to R. P. England, Hastings, $22,709—10.3 mi. S.P. 9-22-A. and 13 mi. S.P. 21-26, Sect. 1, and S.P. 21-24, Sect. 4, to Erickson-Johnson and R. B. Frazer, 3611 22nd Ave. S., Minneapolis, $44,107 and $60,474 respectively—9.1 mi. S.P. 23-28, Sect. 2, to Farrell & Clark, 3338 University Ave. S.E., Minneapolis, $68,863. Grand total $685,222. Noted Oct. 8.

Montana—State Hy. Dpt., Helena, grading, surfacing 16.007 mi. Toole Co., to General Constr. Co., Colman Bldg., Seattle, Wash., $94,283—bridges in Yellowstone Co., to T. W. McGrever, Butte, $5,475—grading 34.273 mi. Petrolium and Garfield Counties and 15.466 mi. Valley Co., to T. J. Tobin Constr. Co., Sioux Falls, S. D., $139,480 and $116,798 respectively—9.703 mi. Jefferson and Broadwater Counties, to Tomlinson Arkwright Constr. Co., Great Falls, $125,259—graveling 6.993 mi. Roosevelt Co., to Thornquist Constr. Co., Great Falls, $8,513—graveling and crushed rock surfacing 24.935 mi. Garfield Co., to G. F. Lamport & Co., Billings, $26,063—bridges on F.A.P. 256 to McLoughlin Constr. Co., Livingston, $22,644—bridges, Jefferson and Broadwater Counties, to H. B. Berkley, Three Forks, $9,129—bridges Valley Co., to Mackin & Berg, Brockway, $22,416. Grand total $570,060.

Nevada—State Hy. Dept., Carson City grading graveling 32.03 mi. hy. between Beatty and Goldfield, Nye and Esmeralda Counties, to Isbell Constr. Co., Carson City, $148,809. Noted Oct. 14.

N. J., Trenton—State, ¼ mi. 25 ft. concrete road from Soldier and Sailors Memorial Building to Calhoun St., concrete approach from Willow St., landscape work and grading, to Karno-Smith Co., Broad St. Bank Bldg. $194,900.

N. Y., St. George—J. Lynch, pres. Richmond Boro, Boro Hall, curbing Barnard Ave., to Triforlio Constr. Co., $7,950. Noted Oct. 15.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, bituminous repaving Richmond Ave. and Amboy Rd., to Highway Impvt. & Repair Co., Furmans Island, Brooklyn, $66,740 and $31,246 respectively. Noted July 30.

Ohio—O. W. Merrell, dir. hys., Columbus, brick paving, incl. furnishing, delivering brick, 0.908 mi. Sect. "c-1" Cleveland-Canton Rd., to Roehl Bros. Paving & Constr. Co. 7008 Dennison Ave., Cleveland, $112,064—1.647 mi. Sect. "Bedford" Cleveland-Akron Rd., to N. Siegal, 622 Western Reserve Bldg., $213,690—0.961 mi. Sect. "F" same road, to F. W. Stollfus, 1926 Schaaf Rd., Cleveland, $116,829, all foregoing in Cuyahoga Co. Grand total $442,583. Rejected bids to have been opened Oct. 20, macadam paving 6.043 mi. Sects. "M" and "N" Dayton-Troy Eastern Rd., Montgomery Co., $69,025, will readvertise.

Pa., Uniontown—Improving, widening streets, day labor. $25,000. W. L. Dunn, City Hall, engr.

Texas—G. Gilchrist, state hy. engr., Austin, grading, small drainage structures 13.004 mi. Wheeler Co. and concrete paving 8.24 mi. Waller Co., to J. P. Foty, 411 Burt Bldg. Dallas, $24,302 and $109,926 respectively, est. $42,000 and $160,000 respectively—concrete paving 3.123 mi. Brazoria Co., to Broussard-Warfield Co., Beaumont, $51,515 est. $78,000—grading, drainage structures 13.592 mi. Stonewall Co., to Womack-Henning Constr. Co., Sherman, $37,993 est. $60,000—11.866 mi. Reagan Co. to E. F. Bucy & Son and C. T. Childs, Rising Star, $23,275 est. $40,000—6.651 mi. Cherokee Co., to M. A. Gunter, Kosse, $20,952 est. $32,000—caliche base and surface courses 11.612 mi. Pecos Co., to F. P. McElwrath Constr. Co., Corsicana, $29,750 est. $50,000—grading, drainage structures, caliche base courses 6.45 mi. Upton Co. to Brown & Root, Inc., Colorado St., Austin, $39,170 est. $44,000—17.742 mi. Andrews Co., to McClure & Denison, Tecumcari, N. M., $72,558 est. $120,000—caliche and waterbound stone macadam base courses, triple bituminous surface treating 14.709 mi. Brown Co., to Cage Bros. Bishop, $109,828 est. $110,000—triple asphalt surface treating 9,466 mi. Van Zandt Co., to D. F. Parmalee Nacogdoches, $32,900 est. $48,000. Grand total $552,169.

Wash., Port Orchard—Comrs. Kitsap Co., grading, crushed stone paving 3.18 mi. Lateral Hy. 3, to Halleran Bros., Olalla, $31,031. Est. $40,000. Noted Oct. 8.

Ont., Hamilton—Asphalt on concrete paving, grading Carling St. $3,385—Charlton Ave. $5,210—Plymouth St., $34,605, day labor. Grand total $43,200. W. L. McFaul, City Hall, engr.

Ont., Orillia—Town, asphaltic and concrete paving Couchiching Beach Rd. and concrete sidewalks on several streets, to McNamara Constr. Co., 53 Yonge St., Toronto. Est. $25,000.

Ont., Sudbury—City, levelling, grading, drainage at athletic park, to A. Cherico, 89 Front St. W., North Bay, $25,827.

Ont., Sudbury—Dept. Northern Development, Parliament Bldgs., Toronto, road improvements in Sudbury and Manitoulin Island Area, incl. straightening Sudbury-Caprcol Rd. near Stobie Mine; extending road south of Chapleau; improving Murray Mine Rd., Garson Rd. and North Bay Hy. and Sudbury-Soo Hy., day labor $1,000,000 to be expended this winter for above. J. Sinton, Parliament Bldgs., Toronto, engr.

Ont., Swansea—Village, asphalt paving, to Canada Paving & Supply Corp., Confederation Life Bldg., Toronto, $36,222.

Ont., Toronto—City, brick block and asphalt paving St. Clair Ave., to L. P. Aeri, 28 Grove Ave., $10,130—asphalt paving Avenue Rd., to McNamara Constr. Co. Ltd., 53 Yonge St., $5,234—Hillsdale Ave., to Rayner Constr. Co. Ltd., 159 Bay St., $9,509—Cherry St., to Law Constr. Co. Ltd., 225 Sterling Rd., $8,259. Grand total $33,132.

Ont., Toronto—East York Twp., asphalt and concrete paving 22,000 sq.yd., to Simone Contg. Co. Ltd., 15 Trent St. Est. $80,000.

Ont., Toronto—York Twp., grading asphalt on concrete paving Roselawn Ave., to R. C. Huffman Constr. Co., 331 Bay St., Toronto. $35,400.

Ont., Toronto—Asphalt paving section commissioners St., to Kilmer & Barber Ltd., Harbor Bldg., Sect. A $39,539, Sect. B $40,757.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ariz., Phoenix—Camelback Water Conservation Dist., 417-20 Phoenix Natl. Bank Bldg., agricultural development in Salt River Valley. $516,000 voted. H. S. Reed & S. K. Baker, Fleming Bldg., engrs.

Ariz., Phoenix—Electrical Dist. 5, agricultural development, in Salt River Valley. $280,000-$420,000. H. S. Reed & S. K. Baker, Fleming Bldg., engrs.

N. J., Avon—Beach protection. $25,000.

Tex., Eagle Pass—B. Taylor, Carrizo Springs, and W. C. Moody, San Antonio, purchased 12,500 acre tract in Maverick Co., and plan developing same. Address Central Power & Light Co., Alamo Bldg., San Antonio.

Ont., Riverside—Town filling in ditches along Riverside Dr. $40,000. Work will probably be done by day labor. G. G. Reid, Riverside, engr.

CONTRACTS AWARDED

Ala., Birmingham—A. J. Hawkins, city engr., earth and rock excav. in old channel Village Creek and straightening where necessary incl. 70,000 cu.yd. dry earth and 21,000 cu.yd. dry rock excav., to Peterson & Simmons, 1113 4th Ave. W., $39,200. Noted Oct. 8.

Ind., Anderson—Madison Co. dredging 23 mi. Duck Creek through northern part of county incl. 387,580 cu.yd. excav., to T. McKinney, Windfall, $34,940. Former contract rescinded. Noted Sept. 24.

Ia., Council Bluffs—State Bd. Control, W. H. Gemmell, secy., Des Moines, and Local Park Bd., 6,000 ft. ditch, levee, 40 ft. wide, 8 ft. deep at Big Lake, to E. A. Wickham Co., Council Bluffs, at $0.06 per cu.yd. for excav.

La., East Point—Bd. State Engineers, 207 New Orleans Court Bldg., New Orleans, constructing East Point New Levee, 3,300 ft. long, 8 ft. high, incl. 55,000 cu.yd. excav., on left bank Red River in 19th Louisiana Levee Dist., Red River Parish, near here, to J. J. McKeithen, Grayson, at $0.082 per cu.yd. Noted Oct. 1.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., repairing, extending seawall at Sand Hills, Scituate, to T. J. McCue, 264 North Beacon St., Watertown, $8,050; driving fender piles, Commonwealth Pier 1, Boston, to M. Solimando, 27 School St., Boston.

Massachusetts—Dpt. P. Wks., State House, Boston, furnishing, placing 2,900 tons stone rip rap and chips, and 340 cu.yd. sand fill in 3 separate locations at Menasha Inlet, Chilmark and Gay Head, to Merritt, Chapman & Scott, 292 Pequot Ave. New London, Conn., $12,451. Noted Oct. 22.

Bond Elections

Coming Bond Elections

Water System—Helena, Mont., $600,000.
Sewerage System—Rochester, Minn., $200,000.
Electric Light and Waterworks—Lees Summit, Mo., Nov. 10. $50,000.
City Hall—Santa Monica, Calif., $350,000.
Schools—Claremont, Calif., Nov. 24. $256,000.

Bonds Voted

Waterworks and Sewerage System — Verona, Wis., $30,000.
Sewage Disposal—Redlands, Calif., $90,000.
Sewage Disposal — Traverse City, Mich., $244,000.
Sewer Impvts.—Salt Lake City, Utah, $600,000.
Schools—Scarsdale, N. Y., Bd. Educ., G. A. Marsh, Bus. Mgr. $1,145,000.

Bonds Defeated

Light and Power Plant — Fairfield, Iowa, $40,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Phoenix — FEDERAL BUILDING — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Lescher & Mahoney, 1st Natl. Bank Bldg. of Arizona, U. S. Government Building. $1,200,000. Noted Aug. 7.

Calif., Alameda—SPUR TRACK, etc.—Pub. Rds., 461 Market St., San Francisco, 93½ tons 128 grooved girder rail; 3.3 tons 128 grooved girder rail curved to radii of 175 lin.ft.; 4.3 tons 149 grooved girder rail; 3,200 tie plates 8 x 11 ft. shoulder type, grading, ballasting, laying rails; 8,000 ft. dip and wrap steel pipe; laying 8,000 ft. 6 in. pipe, installing hydrants, gate valves, etc., 6,200 ft. 6 in. copper breating steel pipe, at Government Island. C. H. Sweetser, dist, engr.

Minn., Minneapolis—GARAGE—Treas. Dpt. at office Sup. Archt., plans by Magney & Tusler, 104 South 9th St., 2 story, 165 x 240 ft. garage and repair shop, Nicollet and 3rd Aves., 1st and High Sts.

N. Y., Albany—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., bids about December excavation for U. S. Post Office, Court and Custom House, Bway. Total est. $1,850,000. E. D. Litchfield, 578 Madison Ave., New York, and Gander, Gander & Gander, 17 Steuben St., Albany, assoc. archts. Noted Aug. 20.

N. Y., Herkimer—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by R. E. Sluyter, Herkimer Natl. Bank Bldg., U. S. Post Office. $120,000.

Pa., Jeannette—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by C. H. Sorber, 113 South Main St., Greenburg, Pa., 1 story basement, 100 x 136 ft., brick, stone, Bullitt Ave. and 5th St. $155,000. Noted Sept. 10.

Tex., Tyler—POST OFFICE—Treas. Dpt. at office Sup. Archt., 2 story, basement, stone, steel post office. $360,000. Noted June 18.

Vt., Beecher Falls—INSPECTION STATION —Treas. Dpt. at office Sup. Archt., 1 story inspection station. $56,000.

Vt., Springfield—POST OFFICE—Treas. Dept. at office Sup. Arch., sketches by F. L. Austin, 240 College St., Burlington, 1 story, basement, brick, steel post office. $125,000.

BIDS ASKED

Ala., Tuskegee—BARRACKS—Nov. 17, by Vet. Bu., Arlington Bldg., barrack and dining hall building, incl. roads.

Calif., Los Angeles—HOSPITAL—Nov. 20, by Vet. Bu., Arlington Bldg., Wadsworth Hospital addition, connecting corridors, walks.

Del., Summit Bridge—SHEET PILE—Nov. 24, by U. S. Eng., Wilmington, 19,200 sq.ft. steel sheet pile for Cut-off wall; adv. E. N.-R. Nov. 5.

Fla., St. Petersburg—POST OFFICE—Nov. 17, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging post office; adv. E. N.-R. Nov. 5.

Ga. Fort Valley—POST OFFICE—Nov. 12, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Nov. 5.

Ga., West Point—POST OFFICE—Nov. 18, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. $71,000.

Ill., Chicago—MITER SILLS—Nov. 9, by U. S. Eng., 333 North Michigan Ave., altering miter sills and emergency dam masonry, installing gages, incidental work at Lockport, Dresden Island, Marseilles and Starved Rock locks.

Kan., Leavenworth — ADMINISTRATION HOME—Dec. 1, by Vet. Administration, Arlington Bldg., veterans administration home, incl. roads, walks, grading, drainage; adv. E. N.-R. Nov. 5.

Ky., Pikesville—POST OFFICE—Nov. 23, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Nov. 5.

Louisiana—REVETMENT—Nov. 17, by U. S. Eng., Prytania St. and River Front, New Orleans, 1,450 lin.ft. wooden revetment along Collette Levee; 2,230 lin.ft. Monsecour Levee, 1,000 lin.ft. Fairview Levee, 1,010 lin.ft. Story Levee, 1,430 lin.ft. Pecan Grove Levee, all foregoing in Lake Borgne Levee Dist., 5,661 ft. along Triumph Levee, 1,240 lin.ft. Jonior Point—Celeste Levee, 1,010 lin.ft. LaRousite-Alliance Levee, all in Barataria Levee Dist.

La., Morgan City—POST OFFICE—Nov. 27, by Treas. Dept. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. Nov. 5.

La., Shreveport—HEADQUARTERS — Nov. 20, by Con. Q.M., headquarters building, Barksdale Field. $72,000 appropriated; adv. E. N.-R. Nov. 5. Noted Sept. 17.

La., Shreveport—ROAD—Nov. 20, by Con. Q.M., rolled gravel roads at Barksdale Field. Noted Oct. 1.

Mass., Andover—POST OFFICE—Nov. 26, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Jan. 29.

Mo., Rocheport—CLUMP DIKES—Nov. 21, by U. S. Eng., 700 Postal Telegraph Bldg., Kansas City, 7,810 lin.ft. standard pile clump dikes and 2,000 lin.ft. standard revetment in Missouri River, at Diana Bend, center of work being 3 mi. upstream from here.

Mont., Billings—JAIL—Nov. 30 by Bureau Prisons, Dept. Justice, federal jail.

Nev., Boulder City—RESIDENCES—Nov. 10, by Bureau Reclamation Las Vegas, nine 1 story, basement, concrete, brick residences, concrete found. $50,000. Walker Young, Las Vegas, resident engr.

N. Y., Brooklyn—CABLE, etc.—Nov. 16, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., cable and reels.

N. Y., Brooklyn—CABLE, etc.—Nov. 24, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., cable reels.

Okla., Saplupa—POST OFFICE—Nov. 20, by Treas. Dpt. at office Sup. Archt., 1 and 2 story, basement, rein.-con., brick, steel, stone. $125,000. Noted Aug. 19.

Ore., Nyssa—ELEVATOR—Spec. 529—Dec. 4, by Bureau Reclamation, 9,000 lb. live-load capacity, automatic, electrically-operated, combined freight and passenger elevator, in Owyhee Dam, Owyhee Project, Oregon-Idaho, about 21 mi. southeast of here; adv. E.N.-R. Nov. 5.

Pa., Allentown—POST OFFICE—Nov. 10, by Treas. Dpt. at office Superv. Archt., U. S. Post Office. Noted June 11.

Pa., Pittsburgh—DAM—Nov. 16, by U. S. Eng., dam 4, Monongahela River.

S. C., Ezell—MONUMENT—Nov. 17, at office Con. Q. M. Fort Bragg, N. C., monument addition at Cowpens Battlefield, near here; adv. E. N.-R. Nov. 5.

Tenn., Memphis—BRUSH and POLES—Nov. 6, by U. S. Eng., McCall Bldg., 10,000 cords brush and poles for use in willow-mat revetment work.

Tex., Fort Bliss—PUMP—Nov. 18, by Con. Q.M. deep well turbine pump, constructing pump house, derrick, pipe line with Venturi meter, fittings to deliver water from Well 5 to Post Pumping Station.

Tex., Galveston—QUARTERS, etc.—Nov. 27, by Treas. Dpt. at office Sup. Archt., Officers Quarters (Buildings 4 and 5) and Recreation Building (6) at U. S. Marine Hospital; adv. E.N.-R. Nov. 5.

Va., Fort Monroe—BACKFILL—Nov. 13, at office Corps Area Eng., 311 St. Paul Pl., Baltimore Md., 4,200 cu.yd. backfill behind seawall.

Va., Martinsville—POST OFFICE—Nov. 12, by Treas. Dpt. at office Sup. Archt., enlarging, remodeling U. S. Post Office; adv. E. N.-R. Nov. 5.

CONTRACTS AWARDED

Ark., Forrest City—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to W. B. Smith, Eldora, Kan., $53,600. Noted Oct. 1.

Calif., San Diego—DREDGING—Spec. 6686—Dist. P. Wks. Officer, 11th Naval Dist., 100,000 cu.yd. at Naval Operating Base, to Standard Dredging Co., Central Bldg., Los Angeles, $47,500. Noted Oct. 6.

Conn., Derby—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to F. J. Smith, Derby. $60,000. Noted Oct. 1.

D. C., Wash—HOUSEWALKS—D. Lynn, archt., Capitol, housewalks, underground sprinkler system, in connection with U. S. Botanic Garden, to A. L. Smith Co., 2539 Pennsylvania Ave. N. W., $126,700. Noted Aug. 20.

Ill., Chicago—STEEL PILING—U. S. Eng., 1st Chicago Dist., 333 North Michigan Ave., steel piling for Kempsville and LaGrange Conferdams, to J. T. Ryerson & Co., Inc., 2558 West 68th St., $18,662. Noted Sept. 24.

Ia., Albia—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Anderson & Co., 56 East 89th Pl., Chicago, Ill., $55,000. Noted Oct. 1.

Ia., Centerville—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, 32 x 56 ft. post office to B. S. Staley, 214 East Jackson St., $17,868. Noted Sept. 24.

Kan., Fort Leavenworth—HANGAR—Con. Q.M., double hangar with annexes and boiler house annex, to Harman Eng. Co., 844 North Rush St., Chicago, Ill., $55,470. Noted Oct. 1.

La. Shreveport—GAS DISTRIBUTION SYSTEM—Con. Q.M. Barksdale Field, gas distribution system at Barksdale Field, to W. H. O'Toole Constr. Co., Monroe, $28,000. Noted Sept. 3.

Md., Annapolis—BUILDING—Spec. 6593—Yards & Docks, Navy Dpt., naval engineering experiment station, to H. W. Cord Co., Inc., 1003 K St., N. W., Wash., D. C., $59,233. Noted Oct. 15.

Md., Baltimore—SEARCHLIGHT TOWERS—U. S. Eng., 2 searchlight towers, Ft. Monroe, to Roanoke Iron Bridge Wks., Inc., Roanoke, Va., $5,377.

Mass., Gloucester—BREAKWATER—U. S. Eng., Custom House, Boston, repairing breakwater, incl. 480 tons stone, 1,200 tons rubblestone, 600 tons stone and 30 short ton pines, to W. R. Farrell. 57 Long Wharf, Boston, $6,778. Noted Oct. 8.

Mo., Mountain Grove — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Bushboom Bros., Fairbury, Neb., $53,500. Noted Oct. 8.

New Jersey—DREDGING—U. S. Eng., Phila., Pa., dredging in Delaware River between Delanco and Roebling, to Standard Dredging Co., 233 Bway., New York, $241,800. Noted Sept. 10.

Texas—DREDGING—U. S. Eng., Galveston, 4,760,000 cu.yd. from Houston Ship Channel to Atlantic Gulf & Pacific Co., 15 Park Row, New York, $175,644. Noted Sept. 17.

Tex., Georgetown — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Landis & Young, Georgetown, $59,900. Noted Oct. 1.

Wis., South Milwaukee—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to C. B. Johnson, 306 South Wabash Ave., Chicago, Ill., $52,875. Noted Oct. 1.

GRADE CROSSINGS

PROPOSED WORK

Mo., Kansas City—See "Bridges."

N. Y., Mount Vernon—New York, New Haven & Hartford R.R. Co., E. E. Oviatt, ch. engr., New Haven, Conn., reconstructing hy. bridge carrying Granatan Ave. over railroad. $46,500.

CONTRACTS AWARDED

New York—Westchester Co. Park Comm., 72 West Pondfield Rd., Bronxville, overcrossing at Tarrytown Rd., Eastview on Saw Mill River Parkway, Greenburgh and Mount Pleasant, to Smith Bros., Pelham, $60,040. Noted Sept. 24.

PIERS AND WHARVES

CONTRACTS AWARDED

N. Y., New York—PIERS—Dpt. Docks, Pier A, Battery Pl., new piers West 48th, 50th and 52nd Sts., North River, Contr. 1953, to Allen N. Spooner & Sons, Pier 11, North River, $4,009,000. Noted Oct. 22.

Ontario—WHARF, etc.—N. Desjardins, secy., Dpt. P. Wks., Ottawa wharf, East Ferry, Digby Co., N. S., to H. B. Bigelow, Canning, N. S., $19,974; repairing quarantine station wharf, William Head, Nanaimo Dist., B. C., to Victoria Pile Driving Co., Ltd., Victoria, B. C., $10,704. Noted Sept. 24 Daily.

Ont., Goderich—PIERS—N. Desjardins, secy. Dpt. P. Wks., Ottawa, reconstructing in concrete superstructures outer ends of north and south piers, to Wm. Birmingham & Sons, Kingston, $32,500. Noted Oct. 1.

AIRPORTS

PROPOSED WORK

Va., Newport News—City and State developing Carey Epes Field at Boat Harbor to provide field for use of air lines. $50,000. **Maturity in 1932.**

POWER AND LIGHTING

PROPOSED WORK

Kan., El Dorado—City, gas distribution system. Burns & McDonnell Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Minn., Rochester—City gas distribution system. $150,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mo., Kansas City—City industrial gas system. $3,000,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., engrs.

BIDS ASKED

N. Y., Albany—Nov. 20, by Superintendent P. Wks., Capitol Bldg., Albany, electric work, replacing cable, electric wiring, electric lighting, electric equipment, for East Section Capitol Building.

N. Y., Yorktown—Nov. 17, by Westchester Co. Park Comm., 72 West Pondfield Rd., Bronxville, electric lighting system for Croton Lake Bridge, Bronx Parkway extension. J. Downer, Bronxville, ch. engr.

CONTRACTS AWARDED

Calif., South San Francisco—City Council, ornamental lighting system, incl. underground system in Grand Ave. (unit 1 of system in Grand Ave.) to Walker-Martin Corp., 1241 East Florence Ave., Los Angeles, $15,355.

Mass. Grafton—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, renewing steam lines at State Hospital, North Grafton, to Underground Steam Constr. Co., 75 Pitts St., Boston, $32,959. This corrects report in Oct. 8 issue.

Mo., St. Louis—See "Factories and Mills."

N. Y., New York—Bd. Educ., 500 Park Ave., New York, electrical work for Samuel Gompers Industrial High School for Boys, to H. G. Hellman, $168,000; fixures, to R and P Mfg. Co., 204 West Houston St., $11,549; heating, to H. Starkman, 132 Brook Ave., $139,440; plumbing, to J. F. Egan, $71,700. Grand total $390,689. Noted Sept. 17.

PARKS AND SPORTS

PROPOSED WORK

Mass. Brockton—Commonwealth of Massachusetts, Dpt. Agriculture, sketches by J. H. Ritchie & Associates, 250 Stuart St., Boston, exhibition booths at Fair Grounds. $50,000.

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Parks and Sports (Continued)

Mass., Oak Bluffs — Syndicate, c/o G. B. Dowling, Highland Sect., sketches by H. Tallant, Vineyard Haven, bathing beach improvements, Highland Bathing Beach. $25,000.

Mass., Quincy—New York, New Haven & Hartford, E. E. Oviatt, ch. engr., New Haven, Conn., soon takes bids abolition grade crossing at Quincy Adams Crossing Bridge from Franklin to Pleasant Sts., 200 ft. long with supporting piers. $700,000.

N. Y., Katonah—R. E. Farley Organization, 342 Madison Ave., New York, golf course, club. To exceed $40,000.

BIDS ASKED

N. Y., New York—Nov. 10, by Park Bd., W. R. Herrick, pres., Park Dpt., Arsenal Bldg., Central Park, repairing sheet asphalt and concrete parkway and park roads, installing lateral drainage system, reconstructing running track, playfield, in Rice Memorial Playfield, Pelham Bay Park, Bronx Boro.

CONTRACTS AWARDED

Mich., Jackson—Sparks Foundation, cascade waterfall in Sparks Foundation Retreat, to North Moller Co., Jackson, $75,000.

N. J. Trenton—See "Streets and Roads."

N. Y., Kings Park—Long Island State Park Comn., Administration, Belmont State Park, Babylon, bath house, 6,300 lin.ft. concrete piling, locker rooms, boiler room, to C. K. Fox, Manhasset, $90,000; plumbing, to F. S. Robbins, Inc., Babylon, $13,740; electrical work, to Werther Electrical Contr. Co., 1133 Bway., New York, $2,595. Grand total $106,065. Noted Oct. 15.

Ont., Port Arthur—Port Arthur Arena Co., Ltd., 176 Court St., general contract 142 x 264 ft. ice arena, brick, concrete, to J. Tocheri, 1010 Donald St., Fort William; roof trusses, to Lamella Trusless Roofs, Ltd., Temple Bldg., Toronto. Est. $65,000. Noted Oct. 8.

N. Y., New York—Park Bd., W. R. Herrick, pres., Park Dpt., Arsenal Bldg., Central Park, removing loose rock on Riverside Dr., to Courtlandt Foundation Co., $31,840; constructing roadway in Battery Park, to Carbloc Paving Co., Stagg St., Brooklyn, $20,132. Noted Oct. 8.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Industry—Dec. 3, by Superintendent Div. Standards & Purchase, Executive Dept., Capitol, Albany, heating work, new boiler, for heating new trade shops, State Agricultural and Industrial School; adv. E.N.-R. Nov. 5.

CONTRACTS AWARDED

Ind., Crawfordsville—Bd. Comrs., P. Stump, aud., remodeling heating, plumbing Orphans Home Building, to F. Ferrel, Crawfordsville. Est. $25,000.

Mass., Worcester—Worcester Art Museum, F. H. Dewey, pres., heating and ventilating in Art Museum, Salisbury and Tucker Sts., to Merrill Co., 98 Granite St., Boston, $25,000. Noted July 30, under "Buildings—Unclassified."

UNCLASSIFIED

PROPOSED WORK

Mass., Quincy — BULK OIL PLANT — Town River Oil Co., J. M. Shea, in charge, 36 Hill St., bulk oil plant, incl. 5 vertical steel tanks, 32 ft. high and 47 ft. diam., at Quincy Point. To exceed $25,000. Private plans.

Utah, Salt Lake City—MESS HALLS, etc.—Utah Natl. Guard, W. G. Williams, Capitol Bldg., plans by Anderson & Young, Continental Bank Bldg., mess halls, bath houses, telephone system, at Camp W. G. Williams. $60,000. Noted Oct. 8.

Sask., Oban—SODIUM SULPHATE DEPOSIT DEVELOPMENT—Whiteshore Lake Salts & Chemical Co., North Battleford, development sodium sulphate deposits on Canadian Natl. Ry., near here. To exceed $75,000. Canadian Salines, Ltd., North Battleford, lessee.

BIDS ASKED

Mass., Boston—ESCALATOR—See "Contracts Awarded."

N. Y., Buffalo—ALTERING—Nov. 20, by Superintendent P. Wks., Albany, miscellaneous additional work, State Office Building; adv. E. N.-R. Nov. 5.

N. Y., Long Island City—STATION FINISH WORK—Nov. 13, by Bd. Transportation, J. H. Delaney, New York, station finish work for Elmhurst Ave. and Grand Ave-Newtown Stations of rapid transit railroad, Queens Boro.

N. Y., New York—BULKHEAD WALL—Nov. 11, by J. McKenzie, comr. Docks, Pier A, Battery Pl., removing existing structures, dredging, disposing material, constructing new bulkhead, platform wth ball, rip rap depositing back fill, for bulkhead wall between West 38th and 42nd Sts., Contr. 1960.

N. Y., Pine Aire Station—ELEVATOR EQUIPMENT—Nov. 18, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, electric elevator equipment, Pilgrim State Hospital.

CONTRACTS AWARDED

Ia., Des Moines—STOCK PENS—Iowa Packing Co., Maury and East 8th Sts., concrete, timber stock pens, to Garner & Stiles Co., 519 14th St. Est. $35,000.

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Mass., Boston — ESCALATOR — Boston Elevated Ry. Co., Park Sq. Bldg., escalator at Forest Hills Station, separate contracts. Est. $75,000. A. J. Blackburn, Park Sq. Bldg., engr. Noted Apr. 9.

Mass., Norfolk—GATE HOUSE—Commonwealth of Massachusetts, Dpt. Correction, gate house at State Prison Colony, to Suffolk Constr. Co., 70 Norwell St., Dorchester, $122,900.

N. Y., New York—STATION FINISH—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., completing construction and station finish Routes 78, 101, 102 and 105, Fulton to 207th Sts. to Gregory Ferend Co., 2 Lafayette St., $107,500. Noted Sept. 24.

Pa., Pittsburgh—WALL—Commonwealth of Pennsylvania, West State Pen. N. S. Pittsburgh, 700 ft. rein.-con. wall, 30 ft. high, at penitentiary, to Rust Constr. Co., Koppers Bldg., $32,965. Est. $42,000.

Va., Richmond—WAR MEMORIAL—City, Memorial Tower (War Memorial) in Byrd Park, to Doyle & Russell, Central Natl. Bank Bldg. Est. $300,000. Noted Sept. 10.

Ont., Welland—FURNACES—American Manganese Steel Co., 333 North Michigan Ave., Chicago, Ill., has awarded contract rebuilding furnaces, to Volta Co., Burgar St., and plans installing additional equipment.

MATERIALS

BIDS ASKED

LUMBER, CULVERT PIPE, etc.—**Glenwood, Ia.**—Nov. 18, at office Auditor Mills Co., bridge, lumber, piling, corrugated culvert pipe. Address County Engineer or Auditor.

GRAVEL, STONE—**Winterset, Ia.**—Nov. 9, at office Auditor Madison Co., 4,700 cu.yd. crushed stone or 5,700 cu.yd. Class A gravel. Address County Engineer or Auditor.

PIPE—**Cohoes, N. Y.**—Nov. 9, by Bd. Contr. & Supply, City Hall, 8,000 ft. 6- to 16-in. c.i. pipe. H. Gabriels, city engr.

FUEL OIL, etc.—**New York, N. Y.**—Nov. 9, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 25,000 gal. fuel oil, 2,000 cu.yd. binder stone, 7,500 cu.yd. steam cinders.

CONTRACTS AWARDED

ROAD OIL—**Fresno, Calif.**—D. M. Barnwell, clk. Fresno Co., 125,000 to 175,000 bbl. road oil, to Associated Oil Co. Associated Oil Bldg., San Francisco, at $0.425 per bbl. Noted Oct. 8.

CAST IRON PIPE—**Long Beach, Calif.**—City Council, 54,000 lin.ft. 6 in.; 27,000 lin.ft. 8 in. and 2,880 ft. 20 in. Class B cast iron pipe, to United States Pipe & Fdry. Co., 2326 East 8th St., Los Angeles, $41,247.

ROCK ASPHALT — **Holyoke, Colo.** — See "Streets and Roads."

IRON CASTINGS—**Boston, Mass.**—City, Supply Dpt., P. A. Chapman, supt., iron castings, two part boxes as specified, to Central Fdry. Co., 105 Cummings St., $4,875.

CAST IRON PIPE—**Lynn, Mass.**—City, City Clerks Office, City Hall, furnishing c.i. pipe, Class B, bell and spigot with cement lining, as specified, to Warren Fdry. & Pipe Co., 75 Federal St., Boston, at $33.90 per ton net.

PIPE, VALVES, etc.—**Victoria, B. C.**—See "Waterworks."

EQUIPMENT

BIDS ASKED

POWER PLANT EQUIPMENT — **Huntingburg, Ind.**—Nov. 9, by City, D. R. Milton, clk., furnishing, isntalling complete boiler setting 361 hp. Bent tube meter tube boiler, also all piping, pipe covering. $25,000.

DIESEL ENGINES—**Bellevue, Ia.**—Nov. 17, by L. J. Gaylor, city clk., two 300 hp. Diesel engines direct connected to 200 kva. generators.

TOOLS and EQUIPMENT—**Billerica, Mass.**—Nov. 10 by Comrs. Middlesex Co., Court House, East Cambridge, tool and equipment for machine shop, incl. band saws, saw bench, ball bearing, turning lathe, ball bearing surface plane, etc., House of Correction.

CONTRACTS AWARDED

CHLORINATORS—**Minneapolis, Minn.**—F. S. Gram, city purch. agt., two 750 lb., chlorinators, to Paradon Co., Arlington, N. J., $3,300.

BOOK PAPER MACHINE—**Canton, N. C.**—See "Factories and Mills."

FOREIGN

New Zealand, Wellington—Dec. 8, by Secretary Posts & Telegraph Dpt., 2000 carbon diaphragms and 200 head receivers with center connection and terminal.

New Zealand, Wellington—Jan. 26, by Secretary P. Wks. Supply & Tenders Com., 25 ton overhead traveling double girder crane.

Venezuela, La Guaira—Municipality of La Guaira, and Venezuelan Government, plans port development, incl. sheds, warehouses, purchasing electric cranes, track materials, switches, repairing, improving jetties, constructing additional piers, dredging, etc. $500,000.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Calif., San Francisco — See "Contracts Awarded."

N. Y., Brooklyn—E. Flagg owner and arch., 11 East 40th St., bids about Dec. 1, separate contracts 8 story, 400 x 400 ft., Bay Ridge Blvd., 72nd and 73rd Sts. $500,000 or more.

CONTRACTS AWARDED

Calif., San Francisco—A. T. Morris & Son, 3500 Fulton St. 6 story, basement, rein.-con., Grove and Fillmore Sts., day labor. $150,000.

Mo., St. Louis—R. Kaplan, 4 story, basement, 50 x 180 ft. apartment, incl. 2 shops, 30-car garage, Washington Ave. east of Kingshighway, to Kaplan-McGowan Co., 315 North 7th St. Est. $150,000.

CLUBS

PROPOSED WORK

N. J., Ridgefield Park—Knights of Columbus, Bergen Ave., sketches altering and constructing 3 story, basement, brick, steel club house addition. $150,000. B. F. McGuire, 705 Linden Ave., Teaneck, archt. Noted Oct. 29.

N. J., Irvington—Owner, c/o A. Kleeman, archt., 987 Spruce Ave., sketches 2 story, basement, brick, steel club house, 40th St. $150,000.

CONTRACTS AWARDED

N. Y., New York—Cosmopolitan Club, 133 East 40th St., 10 story club, to W. L. Binger, 331 Madison Ave. Est. $275,000. Noted Oct. 8.

HOSPITALS

PROPOSED WORK

Mass., Fitchburg—Burbank Hospital, C. T. Crocker, chn. Building Comn., sketches by J. Purdon, 89 Broad St., Boston, isolation unit, Nichols Rd. $150,000 or more. Noted Oct. 22.

Mass., Medfield—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, sketches by M. P. Meade, 80 Boylston St., Boston, brick, administration building, at State Hospital. $150,000.

Mass., Walpole—Organization forming, Mrs. R. B. Eydenberg, chn. Bd. 51 Woolsen St., Mattapan, Jewish Tuberculosis sanatorium, South Walpole. To exceed $150,000. Architect not appointed.

Mo., Springfield—Burge Hospital, 1323 North Jefferson St., soon lets contract 3 story, basement, 40 x 130 ft., rein.-con., brick hospital addition. E. Hawkins, McDaniel Bldg., archt. Noted July 9.

N. Y., Dongan Hills—Dpt. Hospitals, Municipal Bldg., New York, bids about December, general contract, 2 story, basement, brick steel nurses home addition, Sea View Hospital, $450,000. A. Mertin, 34 West 28th St., New York archt.

Pa., Erie—Hamot Hospital, H. Willis, pres. Bd., 4 East 2nd St., plans by Crow, Lewis & Wick, 200 5th Ave., New York, 6 story, basement, 54 x 61 x 106 x 139 x 160 ft., brick, limestone hospital, East 2nd St. $1,000,000.

R. I., Pawtucket—Memorial Hospital, E. N. Littlefield, plans by Monahan & Meikle, 255 Main St., and soon takes bids brick, steel nurses home. $150,000.

Tex., San Antonio—City, c/o C. M. Chambers, mayor, hospital, $150,000. I. Ewig, city engr.

Ont., Hamilton—City plans by Hutton & Souter, 6 James St. S., concrete, brick, steel, stone pavilion at sanitarium. $175,000.

Ont., Hamilton—W. P. Witton, archt., 7 Hughson St., bids early in November, hospital building addition to have 204 ft. frontage, one section will be 2 story, 83 ft. wide central section 6 story, 76 ft. wide, third section 5 story, 45 ft. wide, rein.-con., brick, stone, steel, for Mountain General Hospital, Mountain Park Ave. $610,000. Noted July 9.

BIDS ASKED

Tex., Rusk—Nov. 18, by State Bd. Control, C. D. Teer, chn., Austin, employe's dormitory for State Hospital. W. C. Hedrick, Ine., 1st Natl. Bldg., Fort Worth, archts.

CONTRACTS AWARDED

Mich., Ypsilanti—C. R. Thompson, budget dir., Lansing, general contract two 2 story, basement, rein.-con., brick, steel, stone hospital buildings, plain founds., for Ypsilanti State Hospital, Ypsilanti, and State Administration Bd., Lansing, to Otto Misch Co., 159 East Columbia St., Detroit, $231,213. Noted Oct. 8.

CHURCHES

PROPOSED WORK

Conn., Watertown—St. John's Church, C. P. Teulings, pastor, Watertown, sketches by Cram & Ferguson, 248 Boylston St., Boston, Mass., church, tower, Main St. $150,000 or more.

Mass., Brookline — Harvard Congregational Church, A. G. Leavitt, 35 Vernon St., sketches by Allen & Collens, 75 Newbury St., Boston, rebuilding 1 and 2 story, stone church, recently destroyed by fire, Harvard St., corner Marion St. To exceed $150,000.

N. J., Orange—Our Lady of Mount Carmel Roman Catholic Church, A. Rasi, pastor, 103 South Centre St., sketches 1 story, basement, brick, steel church, $150,000. De Pace & Juster, 151 West 46th St., New York, archts.

Churches (Continued)

N. J., Paterson—St. Ann's Church, C. A. Anid, pastor, 235 Mill St., sketches altering 2 story, basement, brick, steel, Marshall St. $150,000.

N. Y., Jackson Heights—Church of Blessed Sacrament, c/o T. E. Malloy, 367 Clermont Ave., Brooklyn, plans by B. Ferrara, c/o owner, school, Fillmore Ave. and 94th St. $150,000.

N. C., Winston-Salem—First Presbyterian Church plans by Northup & Obrien, Winston-Salem, N. C., and C. Z. Klauder, consult. archt., 1429 Walnut St., Phila., Pa., 3 story, 50 x 220 ft., steel, limestone church. $150,000.

BIDS ASKED

N. J., Essex Fells — Goodwillie & Moran, archts., 56 West 45th St., New York, bids about Dec. 1, general contract 2 story, basement, brick, steel church, parish house and parsonage for St. Peters Episcopal Church, Roseland Ave. $200,000. Noted Oct. 15.

N. J., Morristown—Fanning & Shaw, archts., 49 Ward St., Paterson, taking bids general contract 3 story, basement, brick church, school, Columbia St. and Sussex Ave., for St. Margarets Roman Catholic Church. $150,000. Noted Oct. 1.

CONTRACTS AWARDED

Mass., Brockton—Our Lady of Ostrabrama Roman Catholic Church, I. Limont, pastor, 696 North Main St., 1 story, basement, brick, stone, tile, plain found., North Main St., to T. F. Crowell & Sons, 19 South St. Est. $150,000.

SCHOOLS

PROPOSED WORK

Conn., Portland—Town, W. A. Hall, chn. com., Fairview St., sketches by Towner & Sellew & Associates, Inc., 363 Main St., Middletown, Junior and Senior High Shcool, 2 story, basement, brick, Middlesex Ave. and Main St. $150,000. Noted Sept. 3.

Del., Milton—Plans by E. W. Martin, Du Pont Bldg., Wilmington, 2 story, basement, 150 x 265 ft., grade and high school, incl. gymnasium, auditorium.

Del., Wilmington—Definite plans will be drawn up about Jan. 1, high school.

Ind., Connersville—Bd. School Comrs. plans by H. P. Bartlett, 6017 Lowell Ave., Indianapolis, rebuilding 2 story, basement, brick, steel high school. $150,000.

Mass., Dorchester (sta. Boston)—City of Boston, Dpt. School Buildings, plans by G. E. Robinson, 80 Federal St., Boston, girls' high school, brick, steel, Grove Hall Sect. $900,000.

Mass., Greenfield—Town T. M. Hayes, chn. School Bd., revised plans by B. Dirks, 278 Main St., Junior High school, 2 story basement, brick, steel, plain found., Shattuck Park. $375,000. Noted June 25.

Mo., Kansas City—Bd. Educ. plans by C. A. Smith, 800 Finance Bldg., and soon takes bids East High School addition. $400,000.

N. J., Cliffside Park—Bd. Educ., Palisade Ave., revised sketches by R. J. Cadien, 545 Gorge Rd., 2 story, basement brick, steel, rein.-con. high school addition, Palisade Ave. $225,000. Noted Oct. 29.

N. J., Clifton—Bd. Educ., High School, sketches by Lee & Hewitt, 152 Market St., Paterson, School 2, 2 story, basement, brick, steel, rein.-con. $150,000.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., sketches 2 story basement, brick, steel addition to Euclid School, $150,000; 2 story, basement, brick, steel addition to Lincoln School, $150,000.

N. J., Hillsdale—Bd. Educ., G. M. Strohsahl, dist. clk., new sketches by Hacker & Hacker, 201 Main St., Fort Lee, 2 story, basement brick, steel addition to Junior High School, Demarest Ave. $150,000.

N. J., Jersey City—Bd. Educ., Harrison Ave., school, 200 x 400 ft. site, on Culver and Bayview Aves. To exceed $150 000.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., addition to P. S. 225 Oceanview Ave. and Humboldt St. $400,000.

N. Y., Flushing—Bd. Educ., 500 Park Ave., New York soon takes bids addition to P. S. 20, incl. auditorium, Sanford Ave. and Union St. $150,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt. Noted June 18.

N. Y., Hollis—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, gymnasium and auditorium addition to P. S. 35, 191st St. and 90th Ave. $200 000.

N. Y., Hornell—St. Ignatius Loyola Roman Catholic Church, plans by F. M. Quinlan, Duffy-Power Bldg., Rochester, school.

N. Y., Queens Village—Bd. Educ., 500 Park Ave., New York, soon takes bids general contract addition to P. S. 33, 222nd St. and 92nd Ave. $400,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt. Noted May 7.

Pa., Bellevue—Bd. Educ., S. F. McKee, pres., 73 North Harrison Ave., sketches by E. Stotz, Bessemer Bldg., Pittsburgh, Junior and Senior High School, brick, steel Jefferson and South Howard Sts. $250,000. **Maturity next year.**

Pa., Erie—R. Ford, representative Eagle Indemnity Co. of Cleveland, O., 419 Marine Bank Bldg., Erie, soon takes bids completing general contract Edison Elementary School, 2 story basement, 95 x 171 ft., brick, stone, East Lake Rd. and Beacon St., for Bd. Educ., S. W. Reichard, pres., total est. $185 000; also for 2 story basement, 30 x 90 ft., brick, stone fire station and headquarters, West 12th St. $60,000. Noted Apr. 30 under "Contracts Awarded."

BIDS ASKED

Conn., Stamford—Nov. 9, by City, Building Comm., altering and constructing 2 story, basement, 90 x 100 ft. brick, steel, addition to Junior High School, plain found., State and South Sts. $150,000. Emmens & Abbott, 1 Prospect St., archts. Noted Oct. 22.

Del., Selbyville—Nov. 10, by E. W. Martin, archt., Du Pont Bldg., Wilmington, 2 story, basement, 125 x 190 ft., brick, rein.-con. grade and high school, plain found.

Ill., Champaign—Nov. 20, by University of Illinois, Urbana, East Residence Hall, dormitory for girls, 4 story, rein.-con., brick. $300,000. J. White, Administration Bldg., University of Illinois, Urbana, archt.

N. J., Montclair—Nov. 10, by Bd. Educ., 22 Valley Rd., 2 story, basement, brick, steel addition to Rand School, Fullerton and Chestnut Sts. $150,000. Starrett & Van Vleck, 393 7th Ave., New York, archts. Noted Oct. 1.

N. Y., Albion—Nov. 6, by Bd. Educ., for Junior and Senior High School. $400,000. C. W. Clark, Cortland, archt. Noted May 7.

CONTRACTS AWARDED

Ia. Charles City—A. R. Eggert, secy. Bd. Educ., general contract, 3 story, basement, rein.-con., brick, Bedford stone high school, to Askov Constr. Co., Askov, Minn., $150,000. Awarded Oct. 1.

Minn., Minneapolis—Bd. Educ., 305 City Hall, 4 story, basement, 150 x 300 ft. rein.-con., brick, stone, to Madsen Constr. Co., 618 National Bldg., Minneapolis, $389,599. Awarded about Sept. 30. Noted Sept. 10.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, general contract P.S. 242, to M. D. Lundin Co., Inc. 103 East 125th St., New York, $278,270. Noted Oct. 1.

N. Y., Middle Village—Bd. Educ., 500 Park Ave., New York, general contract P.S. 49, to Supreme Constr. Co., 122 East 42nd St., New York, $270,400. Noted Aug. 26 Daily.

N. Y., New York — Society for Ethical Culture, 2 West 64th St., 3 story building, to be known as Lower School, on 64 x 148 ft. site, Spuyten Duyvil Parkway and Greystone Ave., to Caldwell Wingate Co., 101 Park Ave., New York. Est. $200,000. Contractor soon takes bids on separate contracts. Noted Oct. 29.

N. Y., Rosedale—Bd. Educ., 500 Park Ave., New York, addition to P.S. 138, to M. D. Lundin Co., 103 East 125th St., New York, $151,672. Noted Aug. 26 Daily.

N. Y., West New Brighton—Bd. Educ., 500 Park Ave., New York, general contract P.S. 45, to Wilaka Constr. Co., 335 West 18th St., New York, $226,470. Noted Aug. 20.

Wis., Milwaukee—Bd. School Dist., ornamental iron work and metal work for Solomon Junior High School, 3 and 4 story 200 x 225 ft., to W. Eichfeld & Son, 135 East Pittsburgh Ave., $40,231; cut stone, to Andres Stone & Marble Co., 326 East Keefe Ave., $47,296; sheet metal work, to Reinke & Reinke, 904 North Market St., $21,500; carpentry work, to A. C. Guetzkow, Inc., 5410 West State St., $72,788; plaster, to Walish-Dufton Co., 1729 West Water St., $64,195; terrazo, to Wisconsin Mosaic & Tile Co., 2233 North 4th St., $19,580; tile, to W. F. Durner, 815 West St. Paul Ave., $12,014. Grand total $277,604. Noted Aug. 29.

Ont., Toronto—Bd. Educ., 155 College St., concrete, brick, stone, steel addition to Runnymede School, masonry, to Teagle & Son, 221 Avenue Rd.; carpentry, to A. Munro, 709 Indian Rd.; structural steel, to Frankel Bros., Eastern Ave.; plumbing and heating, to A. H. Read & Son, 692 Shaw St.; electric wiring, to Harris & Marsden, 81A Parkway Rd.; ventilating, to A. Matthews Ltd., 256 Adelaide St., W. Est. $150,000. Noted Feb. 12.

THEATRES

PROPOSED WORK

Conn. Stratford—A. Pickus, Stratford, c/o L. J. A. Julianelle, 42 Church St., New Haven, archt., altering and constructing 1 and 2 story, basement, brick, steel, theatre addition, Main St. $150,000.

Me., Bar Harbor—G. McKay, 243 Main St., and Bunker & Savage, archts., soon lets contract 256 Water St., Augusta, 1 story, basement 75 x 155 ft., concrete, steel theatre. $150,000.

Mass., Peabody—Mutual Development Co., c/o M. Louis, archt., 73 Cornhill, Boston, soon takes bids 1 and 2 story, basement, rein.-con., steel, granite, marble theatre, store, office, concrete found., Main St. $150,000.

BANKS

PROPOSED WORK

N. Y., New York—Bowery Savings Bank, 110 East 42nd St., plans by York & Sawyer, 100 East 42nd St., bank addition. $350,000.

CONTRACTS AWARDED

Mass., Beverly—Beverly Savings Bank, 175 Cabot St., altering and constructing 2 story, basement, brick, stone, steel addition, concrete found., to Parker & Walsh, 119 Webb St. Salem. Est. $150,000. Noted Oct. 1.

N. Y., Brooklyn—Lincoln Savings Bank, 531 Bway., masonry and carpentry work, 2 story, basement, 42 x 100 ft. bank, to W. E. Anderson, 885 Flatbush Ave. Est. $175,000. Noted Oct. 15.

OFFICES

PROPOSED WORK

N. J., Union—Owner, c/o F. Elsasser, archt., 1000 Stuyvesant Ave., 2 story office, store $150,000.

N. J., Montclair—A. E. Ramhurst, archt., 516 Bloomfield Ave., soon lets contract 2 story, basement, brick, steel office, store, Fullerton Ave. and Church St., for H. and D. Harris, 539 Bloomfield Ave. $150,000.

BIDS ASKED

N. J., Montclair—A. E. Ramhurst, archt., 516 Bloomfield Ave., bids about Nov. 15, general contract 2 story, basement, brick, steel office, store, Church and Fullerton Sts., for H. and D. Harris, 539 Bloomfield Ave., $150,000. Noted Oct. 1.

N. J., Paterson—Medical Tower Building Corp., c/o Goodman & Shulman, archts., 20 Smith St., general contract, bids about Dec. 15 on revised sketches 10 story, basement, brick, steel, medical tower office building, Bway. and Auburn St. $250,000. Noted Feb. 5.

STORES

PROPOSED WORK

Minn., St. Paul—J. Friedman, 436 Wabasha Ave., plans by Ellerbe & Co., 525 Minnesota Bldg., 122 x 175 x 300 ft. building, incl. stores on 2 streets, 5 story garage in center, 8th, 9th Cedar and Minnesota Sts. $1,000,000.

N. J., Montclair—Owner, c/o W. J. Fitzsimmons, archt., 626 Central Ave., East Orange, sketches 3 story, basement, brick, steel store, office, William St. $150,000.

BIDS ASKED

Me., Brunswick—W. F. Senter, 124 Main St., taking bids 2 story, basement, brick, stone, marble, steel, concrete bank, store, plain found., Main and Cumberland Sts. $150,000. J. P. Thomas, 537 Congress St., Portland, archt. Noted Oct. 1.

CONTRACTS AWARDED

N. J., Hackensack—Boundary Realty Co., S. Kraft, pres., 7 Prospect Ave., general contract 3 story, basement, brick, steel store, apartment, Essex St. and Prospect Ave., to G. Schwab, 1472 Bway., New York. Est. $150,000. Noted Oct. 1.

PUBLIC

PROPOSED WORK

Calif., Martinez—HALL of RECORDS—Bd. Comrs. Contra Costa Co., bids about December, hall of records building, $500,000. J. J. Donovan, 1916 Bway., Oakland, archt. Noted Apr. 2.

Calif., Santa Barbara—SCIENCE—State Dpt. P. Wks., Sacramento, revised plans by State Architect, science building. Noted Aug. 13.

Mass., Boston—COURT HOUSE—Suffolk Co., J. A. Kelloher, sheriff, Pemberton Sq., court house addition, Pemberton Sq. $3,000,000. Architect not appointed.

Mass., Boston—HEALTH—City, G. R. White fund, E. R. Logan, City Hall, sketches by Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg. Health Unit 7, 3 story, basement brick stone, 147-181 Vernon St., Hampshire and Whittier Sts. To exceed $150,000.

N. J., Hillside—TOWN HALL—Township Comm., Administration Bldg., 2 story, basement, brick, steel. $150,000. **Maturity probably soon.** Architect not appointed.

N. J., West Orange—TOWN HALL—Bd. Town Council, R. C. Alford, clk., Town Hall, receiving competitive sketches 2 story, basement, brick, steel. $250,000. W. Fairweather, c/o Pub. Serv. Corp., Terminal Bldg., Newark, supervy. archt. Noted Oct. 1.

Ont., Fort William—POST OFFICE, etc.—Dominion Govt., Ottawa, post office and customs building. $500 000.

Ont., Guelph—POST OFFICE, etc.—Dominion Govt., Ottawa, post office and customs building, $150,000.

Que., Montreal—PENITENTIARY—Dominion Govt., Ottawa, stone addition to St. Vincent de Paul Penitentiary. $300,000.

Que., Montreal—POST OFFICE, etc.—Dominion Govt., Ottawa, post office, customs building. Est. $1,000,000.

BIDS ASKED

Del., Dover—STATE HOUSE—Nov. 10, by E. W. Martin, archt., Room 402 DuPont Bldg., Wilmington, 3 story, basement, 80 x 160 ft., brick, steel, plain found., State St.

Mass., East Boston (sta. Boston)—LIBRARY—Nov. 12, by City of Boston, Library Dpt., reconstructing 3 story, basement, brick, 222-224 Webster St., Jeffries Point. T. Williams, 42 South Russell St., Boston, archt.

N. C., Raleigh — PRISON — See "Contracts Awarded."

Ont. Windsor—POST OFFICE—Dominion Govt., Ottawa, bids about Jan. 1, post office, customs office and immigration offices, $800,000.

CONTRACTS AWARDED

Me., Bangor—ARMORY, etc.—City, J. Wilson, 3 story, basement, brick, concrete armory, adjoining buildings, to W. H. McPherson, 22 Hodson St. Est. $150,000. Noted Oct. 15.

N. Y. New Rochelle—ARMORY—Adjutant General, Div. Military and Naval Affairs, Capitol, Albany, general contract naval armory, to G. Colon, 103 East 125th St., New York, $144,500; heating, to Gillis & Geoghegan, 537 West Bway., New York, $11,940; sanitary work, to

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Public (Continued)

Fox Plumbing Co., 103 Park Ave., New York, $18,012; electrical work, to Westchester Electric Equipment Co., Yonkers, $4,974. Grand total $179,426. Noted Sept. 24.

N. C., Raleigh—AUDITORIUM — Raleigh Auditorium Building Comn., F. Page, chn., 3 story, basement, Indiana limestone, concrete, 4,000 seating capacity, to C. V. York Constr. Co., Raleigh, $225,696; heating and ventilating, to Chas. W. Christian Co., Charlotte, $26,349; plumbing, to Bashford Plumbing Co., Raleigh, $5,497. Grand total $257,542. Noted Aug. 7.

N. C., Raleigh — PRISON — State Building Comn., prison, day labor, $150,000. Former bids rejected. Will take bids soon material. Noted Aug. 6.

UNCLASSIFIED

PROPOSED WORK

Calif., Santa Ana — MUSEUM — Bowers Memorial Museum Comn., Natl. Bank Bldg., plans by W. H. Austin & F. Lansdown, Natl. Bank Bldg., 2 story, brick, rein.-con., Main St. $150,000.

Mass., Quincy—PASSENGER STATION—New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., soon takes bids Quincy Adams Station, 1 story, brick, stone, steel, plain found. To exceed $150,000.

Mass., Worcester — HOME — Girl's Welfare Society of Worcester, Inc., 2 State St., sketches by Fuller & Delano, 44 Front St., brick, steel, girl's home, Beaver Brook and Chandler Sts. $150,000.

N. J., Westwood—RAILROAD STATION—Erie R.R. Co., G. S. Fanning, ch. engr., 101 Prospect Ave., S.W., Cleveland, O., rescinded contract and rejected bids 2 story basement, brick, steel, railroad station and platform. $150,000. Private plans. Noted Oct. 29.

BIDS ASKED

Mass., Boston — COMMERCIAL — See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Pomona — NEWSPAPER — Progress-Bulletin, 3 story, basement, 119 x 120 ft., rein.-con., tile, plaster, art stone, steel, marble, tile, wrought iron, to C. T. and W. P. Stover, 116 Alexander Ave., Claremont, $190,000. Noted Aug. 27.

Me., Lewiston—HOME—Holy Family Parish, V. E. Nonorque, pastor, 307 Sabattus St., 3 story, basement, brick, stone, plain found., Sabattus St., to C. Bellegarde, 476 Sabattus St., est. $150,000.

Mass., Boston—COMMERCIAL—O. W. Farley, 6 Beacon St., 4 story, basement, brick, steel, plain found., 43-45 Piedmont St., separate contracts. $150,000. W. A. Dykeman, 53 State St., archt.

Mass., Boston—RESTAURANT, etc.—Waldorf System, Inc., 169 High St., reconstructing, altering 5 story, basement, brick, stone, marble restaurant, store, 615 Washington St., to John Bowen Co., 129 Newbury St. Est. $150,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Los Angeles—FACTORY—Los Angeles Soap Co., 617 East 1st St., bids after Nov. 1 (1st unit), 1 story, basement, triangular shaped building, extreme dimensions 140 x 268 ft., Class A basement 617 East 1st St. $200,000. Second unit will be erected in spring to cost $300,000. Morgan, Wells & Clements, 1135 Van Nuys Bldg., archts. Noted Oct. 1.

Calif., San Diego—ICE MANUFACTURING PLANT—C. Gabriel, San Bernardino, 50 ton ice manufacturing plant, 38th St. and El Cajon Ave. $40,000.

D. C., Wash. — LAUNDRY — Knickerbocker Laundries Co., G. Lange, in charge 41 East 42nd St., New York, laundry. To exceed $500,000. **Maturity late 1932.**

Me., Byron—MILL—Menderth, Inc., plans by R. Mayo, 465 Congress St., Portland, altering mill. $50,000.

Md., Baltimore—LAUNDRY—Knickerbocker Laundries Co., 41 East 42nd St., New York, G. Lange, in charge, sketches laundry, $500,000. **Maturity late 1932.**

Mass., Boston—LAUNDRY — Knickerbocker Laundries Co., 41 East 42nd St., G. Lange, in charge, laundry, $500,000. **Maturity late in 1932.**

Mass., Everett—PLANT—Merrimac Chemical Co., Chemical Lane, J. B. Buffer, soon lets contract brick H-acid plant, Chemical Lane, $40,000. Private plans.

N. J., Newark—LAUNDRY—Knickerbocker Laundries Co., G. Lange, in charge, 41 East 42nd St., New York, laundry, in city or vicinity, $500,000. **Maturity late 1932.**

N. Y., Long Island City — LAUNDRY — Knickerbocker Laundries Co., G. Lange, in charge, 41 East 42nd St., laundry, $700,000. Private plans. **Maturity about Dec. 1.**

N. Y., New York—BAKING PLANT—National Biscuit Co., 449 West 14th St., bids in January or later, general contract plant addition, $500,000. Noted Aug. 12.

O., Sandusky—FACTORY—Universal Pipe Co., new plant, $40,000. Private plans.

Pa., Phila. — LAUNDRY — Knickerbocker Laundries Co., 41 East 42nd St., New York, sketches laundry, $500,000. **Maturity late 1932.**

Vt., Westminster—FACTORY—H. C. Baxter & Bros., J. L. Baxter, in charge, Brunswick, Me., canning factory. To exceed $40,000. Architect not appointed.

Wis., Sheboygan—FACTORY—W. C. Werks, archt., 720 Ontario Ave., 2 story, basement 60 x 84 ft., rein.-con., brick, St. Clair St., for Hayssen Mfg. Co., 131 St. Clair St. $40,000.

Ont., Amherstburg—OIL REFINERY—Simrall Refining Corp., Union Central Bldg., Cincinnati, O., G. P. Eichl, mgr., purchased 1,000 ft. land on river front and plans gasoline and fuel oils refinery, 2,500 bbl. daily. R. W. Crothers, c/o owners, ch. engr.

BIDS ASKED

Kan., Neodesho—OIL REFINERY—See "Contracts Awarded."

Mo., St. Louis—GAS PLANT—See "Contracts Awarded."

R. I., East Greenwich—MILL—Greenwich Mills, taking bids 2 story, timber mill. $40,000 or more. C. T. Main, Inc., 201 Devonshire St., Boston, Mass., engrs.

N. J., Little Falls—LAUNDRY—Little Falls Laundry Co., Main St., sketches 1 story, basement, 65 x 85 ft. laundry and 2 story 140 x 280 ft. garage, Main St. $150,000.

CONTRACTS AWARDED

Calif., Pasadena—NEWSPAPER PUBLISHING PLANT—Bennett & Haskell, archts., 311 1st Trust Bldg., general contract 2 story, basement, rein.-con. plant to R. Wescott & Co., 536 South Bway., for Pasadena Post, 71 North Raymond St. Est. $100,000. Noted Oct. 8.

Calif., Santa Paula—LEMON PACKING PLANT—R. C. Wilson, archt., 112 South Mill St., general contract 1 story, basement, rein.-con., to Johnson & Hansen, 64 North 1st St., Ventura, $40,857. Noted Oct. 27.

Ind., Ft. Wayne — FACTORY — Wayne Co., Tecumseh St., general contract rein.-con., brick, steel, Canal and Tecumseh Sts., to Indiana Eng. & Constr. Co., 201 Central Bldg. Est. $40,000.

Ind., Indianapolis — FACTORY — Beach & Arthur, Inc., 221 West 4th St., 1 story, basement, 40 x 104 ft., brick, steel addition, 2900 Columbia Ave. $40,000. Owner builds. Private plans.

Kan., Neodesho—OIL REFINERY—Standard Oil Co. of Kansas, oil refinery addition, day labor and separate contracts. $250,000.

Mass., Everett—BOTTLING PLANT—Merrimac Chemical Co., Everett, 1 story, 60 x 100 ft., brick, rein.-con. central bottling plant, plain found., Chemical Lane, to A. C. Peters, 46 Cornhill, Boston. Est. $40,000.

Mass., Fall River—SERVICE—Firestone Tire & Rubber Co., 1278 South Main St., Akron, O., 1 story, basement, brick, steel, tile service station addition, plain found., 16th and Pleasant Sts., to C. H. Hodgate, 270 Bedford St. Est. $45,000. Noted Sept. 24.

Mo., St. Louis—GAS PLANT—Laclede Gas Light Co., 11th and Olive Sts., remodeling gas plants, distribution system adjusting equipment company's gas plants, distribution and service lines, customers appliances to permit mixing natural gas with present manufactured gas, own forces. $500,000. Private plans.

N. C., Mayo Mills—MILL—Washington Mills Co., Mayodan, 4 story, basement, 100 x 100 ft. building, to Fiske-Carter Constr. Co., Greenville, S. C. $50,000.

N. C., Canton—PAPER MANUFACTURING PLANT—Champion Fibre Co., R. B. Robertson, pres., 3 new building additions. Book paper machine awarded to Pusey-Jones Corp., Wilmington Del., $450,000-$500,000. Total est. $1,000,000. Noted Dec. 11.

Tex., Amarillo—ICE PLANT—H. C. Badger, & A. Davidson, c/o Herring Hotel, 1 story, 7 x 145 ft., brick, tile, to A. Randall, Amarillo. $50,000. Noted Sept. 24, under "Contracts Awarded."

Wis., Sheboygan—FACTORY—Lakeside Bottling Co., E. Janseen, genl. mgr., 715 North 5th St., 2 story basement, 30 x 88 ft., rein.-con., brick, Calumet St., to Wendt Bros. Co., 1907 Cooper Ave.

Wyo., Casper—REFINERY—Standard Oil Co. of Indiana, 137 West 11th St., Indianapolis, Ind., 6,500 bbl. p.d. (cracking unit) refinery, to M. W. Kellog Co., 225 Bway., New York.

Ont., Guelph—FACTORY—Canada Gypsum Co., Hagersville, 1 story, 75 ft. square steel, concrete building, 4 new kilns, new machinery equipment for gypsum manufacture, to C. Crenna, 204 Elizabeth St.

GARAGES

PROPOSED WORK

Mass., Wellesley—H. O'Shaughnessy, c/o J. J. O'Shaughnessy, archt., 80 Boylston St., Boston, soon takes bids 1 story, brick, rein.-con., steel service station, plain found. $50,000.

N. J., Union City—Owner, c/o J. G. Helmers, archt., 147 Summit Ave., sketches 2 story, brick, steel garage. $150 000.

BIDS ASKED

Mass., Danvers—G. Stahler, 15 High St., Middletown, taking bids 1 story, 60 x 100 ft., brick, concrete steel garage and showroom, plain found., Maple St. $40,000. G. H. Fanning, 221 Essex St., Salem, archt. Noted Oct. 22.

N. J., Montclair—See "Contracts Awarded."

CONTRACTS AWARDED

Ind., Evansville—Standard Oil Co., 137 West 11th St., rein.-con., brick, steel super service station, Franklin and Fulton Sts. $40,000. Owner builds and awards separate contracts. Noted Jan. 29.

Me., Bangor—A. E. Webber, c/o Webber Motor Co., 142 Exchange St., 1 story, basement, 90 x 175 ft., brick, steel auto service and sales station, plain found., to O. Nelson Co., 194 Exchange St. Est. exceeds $40,000.

Mass., Middleboro—Nemasket Transportation Co., West Grove St., 1 story, 65 x 110 ft., rein.-con., brick, steel garage, plain found., to G. Starbuck, 61 Oak St. Est. $40,000. Noted Oct. 22.

Mass., Wareham—J. Jason, Main St. 1 story, 55 x 115 ft., concrete, steel public garage, salesroom, Marion St., to H. Vose, Main St. $40,000.

N. J., Montclair—W. L. Walker, 190 Gates Ave., 2 story, basement, brick, steel garage, separate contracts. $150,000. Private plans.

SHOPS AND FOUNDRIES

CONTRACTS AWARDED

Mass., South Boston (Sta. Boston)—FOUNDRY—Downer Kerosine Co., 116 West 1st St., rebuilding 2 story, 50 x 110 ft., brick, West 1st St., recently destroyed by fire, to J. G. Bertram, 307 West 3rd St. Est. $40,000.

POWER PLANTS

PROPOSED WORK

Ga., Augusta—City revising estimates power plant. $1,000,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo. engrs. Noted Dec. 4.

Ill., La Salle—City, light plant. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mich., Detroit — Detroit Zoological Comn., Nine Mile Rd., and Woodward Ave., plans by Donaldson & Meier, 1601 Washington Blvd. Bldg., 1 story, 50 x 50 ft., brick, steel, concrete boiler house, plain found., 60 ft. concrete stack, Nine Mile Rd. $50,000.

Oklahoma—Grand Hydro, Inc., c/o W. E. Hudson, Ritz Bldg., Tulsa, plans to take bids within 90 days for hydro-electric development on Grand River Surveys completed. Est. $26,000,000. Fargo Eng. Co., Jackson, Mich., engrs. Noted July 17, 1930.

BIDS ASKED

Ia., Glidden—Nov. 10, by Town Council at American Legion Room Block 7, E. Mereness, town clk., 32 x 40 ft., power plant, 17 ft. high, incl. two 150 hp. Diesel engines, direct connected to 100 kva. 3-phase, 60 cycle, 2,300 volt, A. C. generators, 300 to 500 R.P.M. speed with direct connected exciters, installed complete with founds., equipment incl. 12,000 gal. storage tank and fuel oil, cooling system, 5 panel switchboard, incl. 2 generator, 2 feeder and 1 street lighting panels. $60,000. Henningson Eng. Co., 326-30 Union State Bank Bldg., Omaha, Neb., consult. engrs.

CONTRACTS AWARDED

Ind., Ft. Wayne—Bd. P. Wks., boilers and stokers for light plant, boiler house, equipment to Babcock & Wilcox, 85 Liberty St., New York, $127,700. Total est. $252,000.

Ind., Ft. Wayne—Bd. P. Wks., City Hall, furnishing, installing power house equipment, incl. 2 B and W boilers, 2 Westinghouse stokers for boilers, mechanical equipment, to Babcock & Wilcox Co., 85 Liberty St., New York, $127,700. Est. $165,000. Noted Aug. 20.

Ia., Lenox—L. B. Carruthers, city clk., 38 x 52 ft., concrete, brick power plant, 20 ft. high, incl. 2 Diesel engines, switchboard, accessories, distribution system, for City, to Fairbanks Morse & Co., 9th and Harney Sts., Omaha, Neb., $71,600. Noted Sept. 17.

Mass., Holyoke—Holyoke Water Power Co., R. E. Barrett, pres., 1 Canal St., Power Unit 8, 2 story, 35 x 50 ft., brick, concrete, to LaFrance Constr. Co., 292 Maple St. Est. $40,000. Noted Apr. 9.

WAREHOUSES

PROPOSED WORK

Mass., Provincetown—F. A. Days & Sons, 1 or 2 story, storehouse, Bradford St. $50,000. Private plans.

N. J., Paterson—M. Augenblick & Bro., subsidiary Bordon Co., 5 Bank St., warehouse, East 25th St. $150,000. **Maturity probably soon.** Architect not appointed.

N. Y., New York—Weil Bros. Hardware & Plumbing Co., 507 West 125th St., storage, store, 125th St. and Amsterdam Ave. To exceed $50,000.

N. Y., Oswego—Oswego Independent Ice Corp., 80 x 100 ft. steel, tile cold storage plant, 40 ft. high.

BIDS ASKED

Mass., Fall River—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Fall River—A. H. Leeming & Sons, 425 Bank St., 2 story, brick, steel, storage building and engraving plant, plain found., separate contracts. Private plans.

Mass., Watertown—Kimball Lumber Co., 148 Waltham St., 1 story, Brick, sheet metal storage building, Waltham St., to A. Gray, 424 Lexington Ave. Est. $40,000.

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See proposal advertising on page 86